november 1952

THE FOUNDRYMEN'S OWN MAGAZINE

American Foundryman

American Foundryman

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Sand shaken out of the stack molds in Cutler-Hammer's (Milwaukee) foundry is carried to bucket elevator in left rear and elevated to vibrating screen above storage bin. The application is typical of the effective mechanization which can be achieved by following recommendations included in the article on how to start mechanizing a small foundry, page 53, by W. A. Morley, Olney Foundry Div., Link-Belt Co., Philadelphia.

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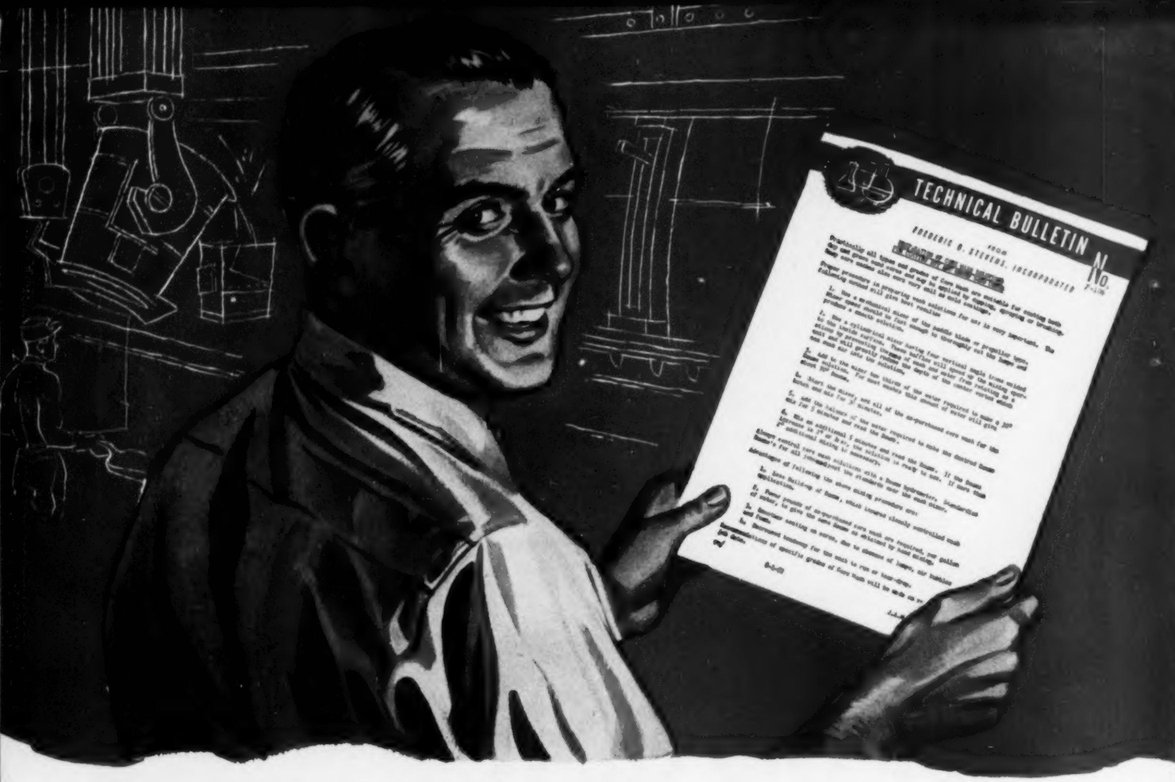

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VOLCLAY BENTONITE
NEWS LETTER No. 30

REPORTING NEWS AND DEVELOPMENTS IN THE FOUNDRY USE OF BENTONITE

"Blows"

Most blows can be directly related to metal conditions. Gassy metal produces blows quite easily, as the gas endeavors to escape through the metal. If the metal becomes dull and solidifies before the gas escapes, blows occur. A molding sand may greatly encourage blows, pinholes, etc. if the molding sand is not of the proper formula, or prepared properly.

If the metal imprisons gasses, blows result. If the gas force is sufficient to blow through the molten metal surface, external holes develop. If not, internal porosity develops.

A chief source of blows can be directly attributed to the moisture content of the molding sand. It is estimated that a square foot of molding sand 1/16" in thickness, tempered to 5% moisture content, produces about 2/3 cu. ft. of steam at 212° Fahr. and 2½ cu. ft. at 2,000° Fahr.

It is estimated that a 400 lb. sand mold containing 3% moisture content erupts over 80 cu. ft. of steam when subject to high heat.

The high percentage of bonding ingredient absorbs much water and holds excess moisture which is detrimental to proper sand conditioning.

To guard against blows, insure proper permeability by using less bond. Add no more than 4%-5% Volclay or Panther Creek bentonite as the bonding ingredient.

Don't close the base sand by adding large amounts of weak and inferior bonds.

Another source of gas comes from organic or other combustible materials added to the sand mixture. A large volume of gas is generated by certain seacoals, pitches, etc., if they are not of the highest grade.

To obtain best pealing qualities, as little as ½% Five Star Wood Flour may be added to replace 3 or 4 times that amount of other carbon materials which greatly reduces gas volume.

Five Star Wood Flour attaches a carbon coating to the sand grains on burning which allows the metal to flow freely over the sand grains. Metal does not stick to carbon. This is accomplished with the least amount of gassy materials present in the sand mixture.

Do not encourage unnecessary venting, as blows can be minimized if bentonite is used to impart permeability. If Five Star Wood Flour is added to replace part of the enormous amount of carbon materials which are customarily added further increase of permeability is obtained.

AMERICAN COLLOID COMPANY

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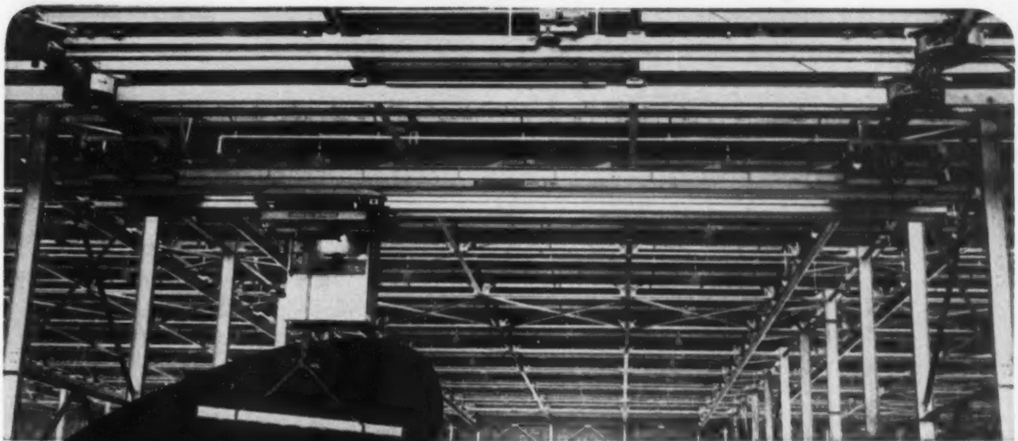

A CRANE *that* TURNS *the* CORNERS!

Imagine a crane that shifts from its craneway to another via 90° turntable—then shifts again at 90° to travel another craneway. It's like driving a car to the middle of an intersection, then instead of just the front wheels turning, all wheels turn at a right angle and the car travels sideways down the side street.

This crane offers fast hoist hook service throughout maximum areas without load transfer from original pick-up.

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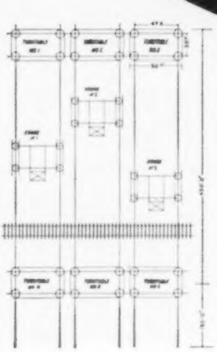

THE AMERICAN MONORAIL COMPANY

13122 ATHENS AVENUE **CLEVELAND 7, OHIO**

"FOUNDROMATIC" SHAKEOUTS

Heavy body of structural and plate steel is completely stress relieved before machining. Heavy cast steel snubbers keep body centered on durable coil support springs even if side loaded. Pivoted motor base design, coordinated with Texrope drive, provides trouble-free operation.

PRODUCTION WAS SPEEDED 96-FOLD at this midwestern steel foundry when the *Foundromatic* shakeout shown was installed! Crane bases are cored out completely in about *five minutes* . . . as compared with an average of *eight hours* required with manual labor.

The *Foundromatic* shakeout, an exclusive and field-proven Allis-Chalmers design, will also radically reduce *your* foundry shakeout and core knockout time. You'll get increased output for these three reasons:

Slash Knockout Time!

1. FASTER SHAKING OUT. Heavy body construction, with decks of 1½ to 2 in. plate steel, gives more "punch" to full load operation.
2. MORE FLOOR SPACE. Shakeout can break up molds as soon as castings are cool, leaving floor area free for re-use.
3. UNINTERRUPTED OPERATION. Rugged two-bearing vibrating mechanism has oversize bearings carrying only eccentric shaft force. And there is no record of shafts or support springs ever breaking.

Get the full story on *Foundromatic* shakeouts, their proven construction features, and how they can benefit *your* foundry operations. Single units built in capacities from one to 25 tons . . . multiple units available to over 100 tons. Call your nearest A-C office or write to Allis-Chalmers, Milwaukee 1, Wisconsin for Bulletins 07B7532 and 07B6365A.

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Vibrating Screens | Cupola Blowers | Motors-Drives Control | Foundromatic Core Dryer | Induction Heating & Melting | Regulex Arc Furnace Control

products and processes

For additional information,

use postcard at bottom of page seventeen.

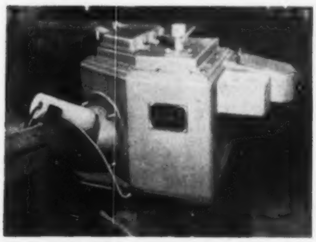
Hardness tester

Pocket-portable tester determines hardness of steel alloys and other metals in range 25 to 65 Rockwell C scale. Direct reading for fast operating. Set includes microball indentor, reticulated microscope, and standard hardness block. Accurate to ± 1½ points C scale. *Pacific Transducer Corp.*

For more data circle No. 1 on card, page 17.

Automatic metal pouring

Device discharges accurate pre-set amounts of molten metal into molds or



cold chamber of most die-casting machines, increases production by eliminating delay of ladling. Takes molten metal from below surface of melt to avoid pouring surface oxides or scum into casting. Controlled by precision electronic timers, acts as a combined holding furnace and pouring unit. Preselected weight of castings repeats automatically. Normal range of castings from ½ lb to 5 lb. Especially suited to zinc alloys and aluminum. *Ajax Engineering Corp.*

For more data circle No. 2 on card, page 17.

Steel pallet

Sled-like material-handling device features tubular-steel runners welded and braced to rectangular, angle-iron frame enclosing a laminated wood deck. Runners permit easy transit over rough pavement and uneven surfaces. Weighs less than wood pallet of same deck dimensions and load potential. Eliminates dangers of injury by wood splinters or projecting fastening devices. Will sustain heavy shocks and centered loads without damage. Designs can be adapted to any material-handling system. *Econoweld Co.*

For more data circle No. 3 on card, page 17.

Portable Yard Ramp

Lightweight, magnesium ramp, available in five sizes, has capacity range of 6,000 to 16,000 lb. Bridge-type underbracing gives maximum strength with minimum weight. Wheel centered on each side balances ramp, permits easy positioning by one man. Hydraulic lifting device positions one end at car door; lower end rests on ground to prevent slipping. *Magnesium Corporation of America*

For more data circle No. 4 on card, page 17.

Oxy-gasoline cutting torch

Blending oxygen and liquid gasoline, hand cutting torch eliminates weight and bulk of acetylene cylinder, is said to offer over-all savings of 25 to 30 per cent in cutting, brazing, scarfing, and similar work. Cutting head design prevents backfiring into handle. *Steel News Industries*

For more data circle No. 5 on card, page 17.

Noise-eliminating ear insert

"Sonic ear valve" contains cylinder that filters out industrial noises harmful to ear drums, yet leaves hearing canal open to receive air and voice-level sounds. Has soft, easy-to-wear, silicon rubber tip resistant to skin oils. *Sigma Engineering Co.*

For more data circle No. 6 on card, page 17.

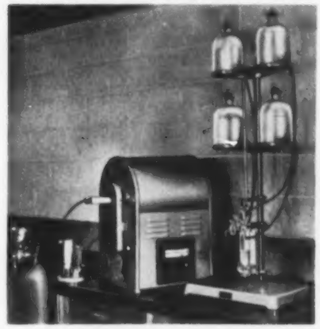
Snap-out Eye Shield

Flexible, one-piece eye shield can be replaced quickly by means of snap-on fitting. Of curved acetate, lens weighs 1¼ oz, can be worn over regular safety glasses to prevent lens pitting. Available in clear or green lenses. *Bausch & Lomb*

For more data circle No. 7 on card, page 17.

Sulfur determinator

Extra convenience, reliability and speed mark the new Dietert-Detroit sulfur determinator. A permanent titration vessel eliminates unnecessary footsteps and lost time between determinations. The bub-



bler is of new design giving maximum gas absorption, and being separate, allows easy cleaning and low-cost replacement. Solutions are fed directly to the titration vessel from visible storage bottles. The elimination of pipettes speeds up preparation of the absorbing solution. Complete and effective rinsing is quickly accomplished using the chemist's time-proven movable tip principle. *Harry W. Dietert Company*

For more data circle No. 8 on card, page 17.

Vibration measurement

"Vibra-Tak" accurately measures speed and amplitude of vibration induced to aid movement of sand and other materials toward outlet of hoppers, bins, pipes, or chutes. Also locates dead spots on equipment on which vibration is needed and locates unwanted vibrations on other equipment. Computes vibrations per min-

ute and checks rpm of high-speed machines. Has range of 2000 to 15000 cycles per minute. Higher speeds can be closely estimated. *Martin Engineering Co.*

For more data circle No. 9 on card, page 17.

Measuring casting porosity

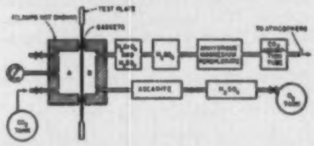
Process measures effectiveness of a plastic impregnant in reducing porosity of aluminum castings to be used in high-vacuum installations. Consists of passing a quantity of carbon dioxide through a test

continued on page 17

products and processes

continued from page 15

plate, trapping it in an absorption tube and weighing it. Weight of the carbon dioxide collected during a measured period of time provides basis for calculating leakage rate through the test plate. This



method is said to measure leakage as low as 10^{-8} cu ft per sq in. per hour at one atmosphere of pressure. *Sam Tour & Co.*

For more data circle No. 10 on the card below.

Electric hoist

Deck-type electric hoist designed for top mounting in double-girder bridge cranes is available in 1 to 15-ton capacities. Has triple-reduction spur-gear drive, enclosed fan-cooled motor, heavy steel suspension frame, push-button-operated heavy-duty contractor. Equipped with friction brake in gear train and solenoid-operated contracting drum-type motor brake. Control station can be mounted in crane cab or remotely located. Controls for operation of trolley and bridge also available. *Yale & Towne Mfg. Co.*

For more data circle No. 11 on the card below.

Identification Tape

Adhering without moisture, removable without leaving traces, tape can be written on with any pointed instrument. Writing appears beneath clear plastic layer which protects message from dust and smudging. In rolls of various lengths and widths, tape has colored borders for coding. *Labelon Tape Co.*

For more data circle No. 12 on the card below.

Porosity sealer

Thermosetting resin impregnated under air pressure fills and seals microporous voids in ferrous and nonferrous metal castings, reduces or eliminates rejects because of microporosity. All of the sealant converts to a solid, yet retains resiliency for expansion and contraction due to temperature changes. Resistant to a wide variety of solvents, water, salts, acids, and weak alkalies, the sealant leaves no surface stain. *Polyplastex International*

For more data circle No. 13 on the card below.

Unit heater

Designed for supplementary or basic warm-air supply, heater can be spot-located to overcome drafts, or used for precise temperature control in production, curing, or storage. Heavy-gauge sheet-metal case, with fractional hp motor blower, adjustable aluminum louvers for deflecting blown air up or down about 30 degrees. Thermal cutout prevents overheating. Operates on 230 or 460 v single or three phase, weighs 79 lb. *Edwin L. Wiegand Co.*

For more data circle No. 14 on the card below.

Darkroom pass tank

Lightproof tank installed through darkroom wall permits separating those operations which require darkroom from those that can be done in light, thus eliminating crowding and speeding work. *General Electric.*

For more data circle No. 15 on the card below.

Heavy-duty conveyor belt

The May-Fran hinged-steel conveyer belt has been constructed to withstand extreme wear incurred in handling heavy, hot or highly abrasive materials. Belting can be assembled in almost any required width or length from stocked component parts. Heavy-gauge, hinged-steel links are assembled in horizontal rows by means of high-carbon steel rods passing through the formed flanges of the links. These flanges form a horizontal cross-rib at each belt pitch which assure steady flow of materials, even on substantial inclines. *May-Fran Engineering, Inc.*

For more data circle No. 16 on the card below.

Insulating fiber

New manmade fiber trade-marked Fiberfrax resists temperatures that melt cast iron yet is so fine it can be used as a superfilter, or as a base for entirely new types of insulation. *Carborundum Co.*

For more data circle No. 17 on the card below.

Heavy-duty metal cutter

The DeWalt ME-2F sprue-cutting machine is one of a line of heavy-duty cutters on which production has been resumed with the easing of war-time restrictions. The ME-2F cuts risers up to four inches in diameter on iron castings and risers up to two inches in diameter on nickel and steel castings. *DeWalt Inc.*

For more data circle No. 30 on the card below.

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Test specimens

Set of common metals and alloys mounted and identified and supplied with photomicrograph, analysis, hardness, etc., suitable for comparisons or teaching. *A. I. Buehler*

For more data circle No. 18 on card below

Dust control

Bulletin describing dust filter, dust control, and other data useful in continuous process industries where uniform suction at all dust points is needed. *Sly Mfg.*

For more data circle No. 19 on card below

Sand reclamation

Description of system for low-cost cleaning of sand for continuous reuse. Contains details of test offered at cost to determine potential savings in particular cases. *Denver Equipment Co.*

For more data circle No. 20 on card below

Truck operator training

"How to Operate a Lift Truck," cartoon-and-text manual for training operators of fork-lift trucks and industrial tractors. Includes data on maintenance, safety, material handling. *Hyster Co.*

For more data circle No. 21 on card below

Flexible tubing

Fume removal, ventilation, dust collection, materials handling, are some uses suggested for tubing described in 4-page illustrated catalog. Available in diameters of less than 1 in. to 30 in., tubing is lightweight, nonkinking, requires no installation skill. *Flexible Tubing Corp.*

For more data circle No. 22 on card below

Changeroom planning

"The Design and Layout of Industrial Changerooms," 16-page booklet illustrated by photos and sketches, for use by design and safety engineers in planning layout of changerooms. Gives architectural standards, suggests dimensioning and equipment. *Moore Co.*

For more data circle No. 23 on card below

Disc grinders

Newly revised 2-color, 16-page catalog illustrates and describes line of single-spindle disc grinders. Contains recent data on flat-surfacing operations. *Gardner Machine Co.*

For more data circle No. 24 on card below

Worker training program

Emphasizing importance of developing programs to train workers for specific needs, new 16-page booklet suggests ways of broadening skills of workers. Outlines organization and operation of skill-improvement programs, provides check list enabling employer to evaluate his needs. *U. S. Dept. of Labor.*

For more data circle No. 25 on card below

Lubrication systems

Useful in planning centralized lubrication with either oil or grease, this 4-page folder describes and illustrates operation of manually, mechanically, and hydraulically actuated systems. *Trabon Engineering Corp.*

For more data circle No. 26 on card below

Air cylinder

Diagrams, charts, detailed specifications, and photographs explain construction, capacity, type of mounting, interchangeability, and other engineering features of air cylinder, indicating its superiority over other mechanisms. *Lindberg Engineering Co.*

For more data circle No. 27 on card below

Rotofinish process

Collection of editorial articles on the Roto-Finish process shows how the process has been applied to specific problems. Included are: case histories on deburring transmission parts; an installation in which 110 different ferrous and nonferrous stampings, castings, forgings were britehoned or deburred; the facts on elimination of hand filing, brushing, grinding and deburring machine parts; deburring and ball burnishing carburetors, brake and aircraft parts; and descriptive articles giving details on the operation and application of Roto-Finish equipment and processes. *Roto-Finish Co.*

For more data circle No. 28 on card below

Compressors

Illustrated bulletin covering functions, application, ratings, features of design, and arrangement and methods of control of single-stage centrifugal compressors. *American Blower*

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ELECTROMET *Data Sheet*

A Digest of the Production, Properties, and Uses of Steels and Other Metals

Published by Electro Metallurgical Company, a Division of Union Carbide and Carbon Corporation, 30 East 42nd Street, New York 17, N. Y. • In Canada: Electro Metallurgical Company of Canada, Limited, Welland, Ontario

How Ladle Inoculants Reduce Chill . . . Produce High-Strength, Machinable Iron

One of the most significant developments in the field of cast iron metallurgy during recent years has been the widespread growth of the process of "inoculation" in producing quality metal to strict specifications. Inoculation has been defined as "a process in which an addition is made to molten cast iron for the purpose of altering or modifying the micro-structure of the iron and thereby improving the mechanical and physical properties to a degree not explainable on the basis of the change in composition."*

Various ladle addition alloys are used for inoculation of cast iron, but there is a wide range in the efficiency and potency of these materials. The 50 per cent and 75 per cent ferrosilicons are mild inoculants, but they are used as ladle additions principally as a means of adjusting the silicon content of cast iron. The 85 per cent and 90 per cent grades of ferrosilicon are much more effective inoculants. Inoculating power is further improved through the use of special inoculating alloys, such as silicon-manganese-zirconium ("SMZ" alloy) and calcium-silicon.

*Definition by H. W. Lownie, Jr.—A.F.S. Symposium on "Inoculation of Gray Cast Iron."

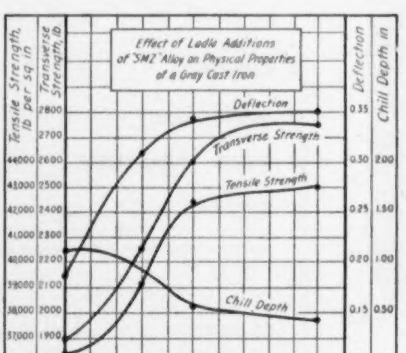
ELECTROMET produces a number of alloys for inoculation, each of which has specific applications. The graphitizing inoculants are:

"SMZ" Alloy	60-65% silicon 5-7% manganese 5-7% zirconium
Calcium-Silicon	30-33% calcium 60-65% silicon
90% Ferrosilicon	92-95% silicon
85% Ferrosilicon	83-88% silicon
Special Graphitizer	A mixture of ferrosilicon and graphite for special uses.
75% Ferrosilicon	73-78% silicon
50% Ferrosilicon	47-51% silicon

These inoculants are usually added to the molten iron as it leaves the cupola spout, or during transfer from one ladle to another.

"SMZ" Alloy—An Efficient Inoculant

The benefits of inoculation are obtained largely as the result of rigid control of the structure of the graphite phase of cast iron which has received this treatment. The results of inoculation on the properties of a typical cast iron are demonstrated by the accompanying illustrations showing the effect of adding various amounts of "SMZ" alloy.



Effects of Inoculation

The effects of graphitizing inoculants are: a drastic decrease in the chilling tendency of a given iron, a mild decrease in Brinell hardness, lowering of the section sensitivity of the metal, a definite increase in tensile strength, and an increase in transverse strength and deflection. These benefits are usually accompanied by improved fluidity, better castability, and improved resistance to wear.

Fig. 1—These curves show how additions of "SMZ" alloy reduce depth of chill and improve mechanical properties when added to a series of irons selected to give the following final analysis: 3.10 total carbon, 0.60 combined carbon, 1.80 silicon, and 0.50 manganese.

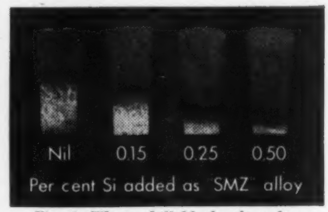


Fig. 2—These chill blocks show how progressive additions of "SMZ" alloy reduce the depth of chill.

New Stabilizing Inoculant

For the production of cast iron, ELECTROMET developed recently a special low-carbon foundry ferrochrome. This silicon-chromium alloy is so balanced in composition that it increases the strength and hardness of gray iron, without increasing chill. The new alloy has a nominal analysis of 30 per cent silicon and 50 per cent chromium. It has excellent solubility in iron, and the inoculating effect of the silicon content makes it possible to add up to 1 per cent chromium to gray iron as a ladle addition, with no appreciable increase in chill. Castings treated with the new alloy have an excellent balance between machinability and good resistance to wear.

Booklets Available

Further information about ladle inoculants is given in the booklets, "SMZ Alloy and Its Uses as a Ladle Addition to Cast Iron" and "Silicon-Chromium Alloy in Complicated Iron Castings." You may obtain copies, free of charge, by writing or phoning to the address given above or to the nearest ELECTROMET office: in Birmingham, Chicago, Cleveland, Detroit, Los Angeles, New York, Pittsburgh, or San Francisco. In Canada: Welland, Ontario.

It's FANNER for Service on CHAPLETS and CHILLS

1

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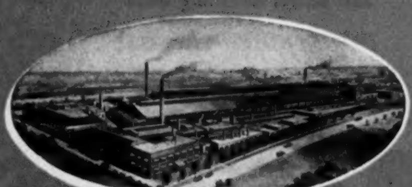

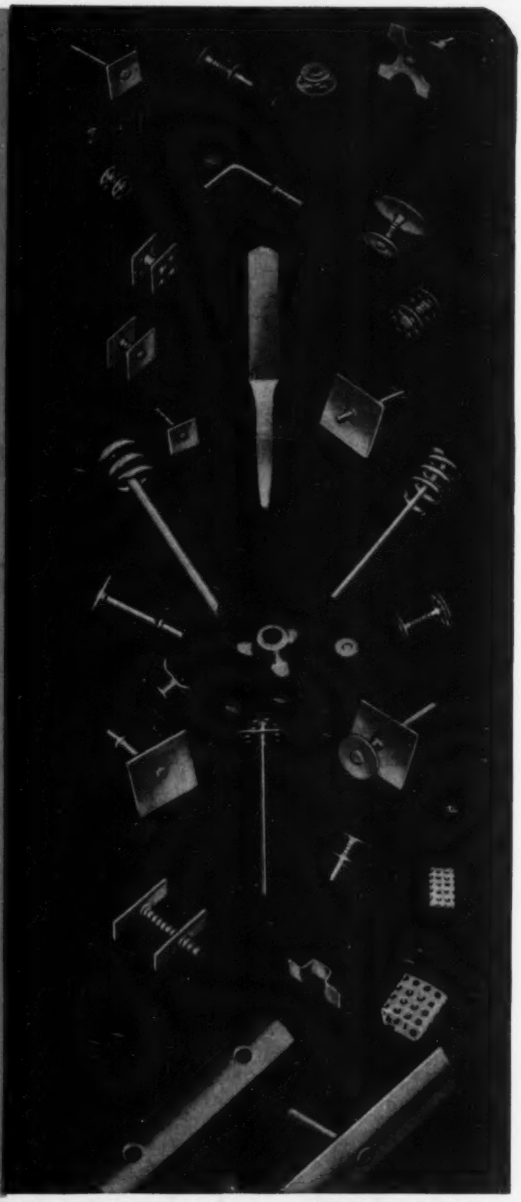

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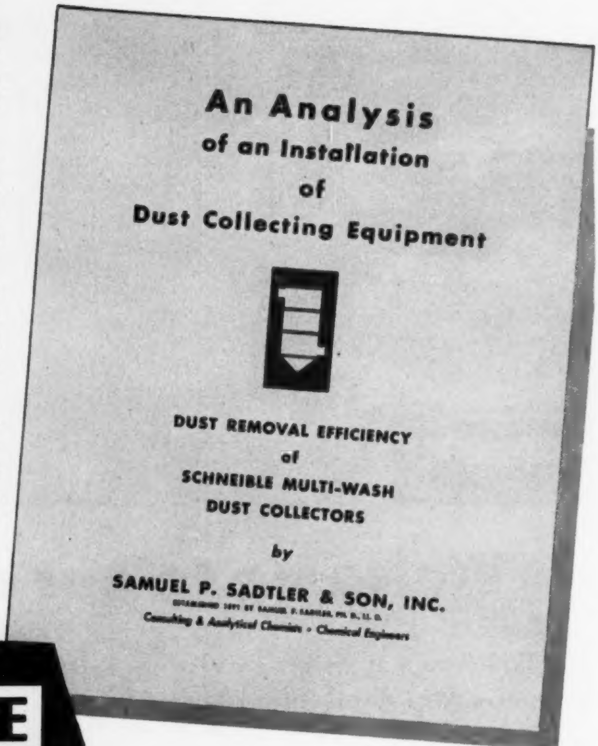

An Analysis of an Installation of Dust Collecting Equipment

DUST REMOVAL EFFICIENCY of SCHNEIBLE MULTI-WASH DUST COLLECTORS

by

SAMUEL P. SADTLER & SON, INC.

Consulting & Analytical Chemists • Chemical Engineers

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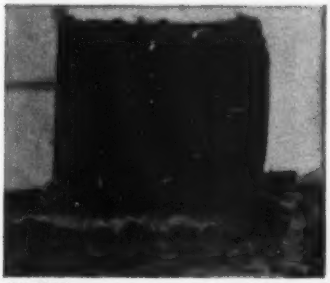

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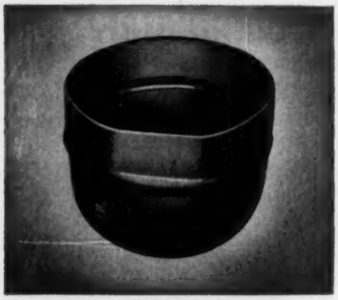

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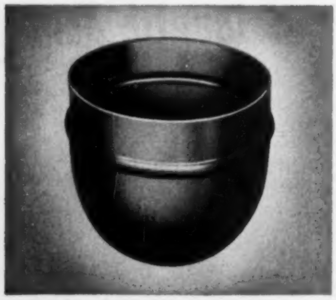

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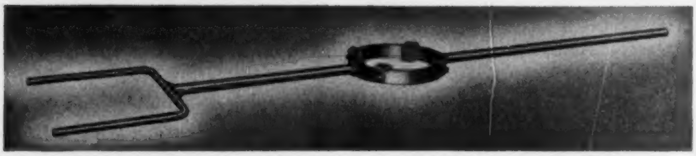

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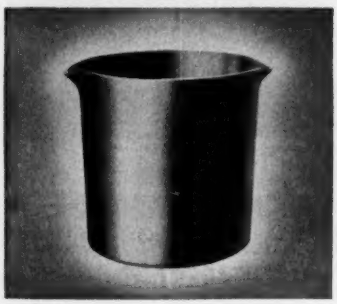

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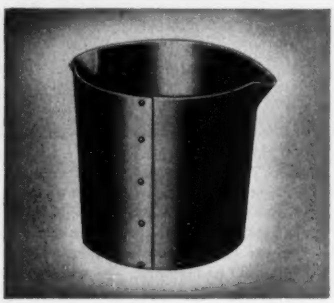

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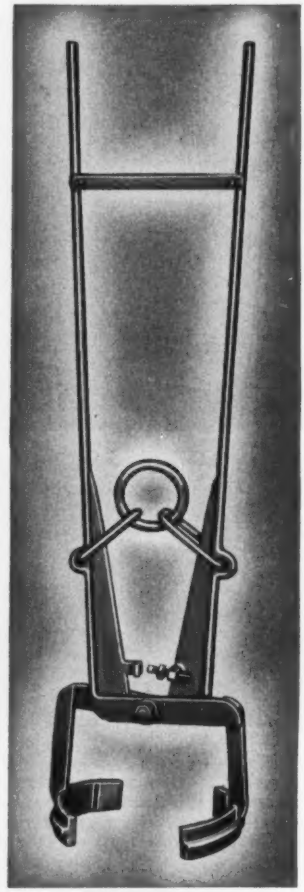

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Foundrymen in the news

Walter W. Edens, one of the six scientists who recently joined the research staff of Allis-Chalmers Manufacturing Co., Milwaukee, will supervise melting and foundry research for the company. Mr. Edens received his B.A. in mechanical engineering from Marquette and his M.S. from the University of Wisconsin, and has had more than 15 years' experience in the metal working field. He is a past president of the Milwaukee Chapter of A.F.S. The other new Allis-Chalmers men are **Matt Bushner, W. B. Harrison, Dimitri Kececiogulu, Donald F. Kuemmel,** and **Dr. Arthur B. Michael.**

R. L. Bernhard is the new manager of the recently created Centrifugal Compressor Dept. of American Blower Corp. A graduate of University of Alabama, he brings to ABC over 18 years' experience in the centrifugal compressor field.

Joseph S. Imirie has been promoted to the newly created position of assistant to the president of Carborundum Co., Niagara Falls, N. Y. In his new position, Mr. Imirie will render staff assistance in the general business management of the company and will assist in development and promulgation of company objectives, policies, organization structure and programs.

Kempton Dunn has been elected first vice-president and **William B. Jordan** treasurer of American Brake Shoe Co., New York. Mr. Dunn, formerly vice-president and treasurer, has been with Brake Shoe since graduating from college in 1932. He is also a director of the company. Mr. Jordan, who was formerly assistant treasurer, joined the Brakelok division of the company in 1945.

Earl M. Strick, Erie Malleable Iron Co., Erie, Pa. (right) with some of the gifts received when he appeared on the "Welcome Travelers" broadcast where he was interviewed concerning work of the A.F.S. Youth Encouragement Committee. For Mr. Strick's views, see page 81.

Harold E. Henderson, H. C. Macaulay Foundry Co., Berkeley, Calif., has been loaned to the Turkish Government as a foundry sand technician. He will conduct on-the-job sand training programs in the general region of Ankara and consult with foundrymen on their sand problems. Mr. Henderson began his apprenticeship as a molder with Macaulay in 1910 and has been with the company most of the time since then as molder, foreman, and sand technician. In this last capacity he has devoted his entire attention to the study of sand control. He was active in the formation and work of the Foundry Sands and Mold Materials Committee of Northern California Chapter.

Gerald S. Wellman, until recently vice-president of Lake Carriers' Assoc., has assumed duties as vice-president in charge of development at Case Institute of Technology, Cleveland. Following his graduation from Denison University

Kempton Dunn . . . farther up the ladder.

Harold E. Henderson . . . he's off to Turkey.

Gerald S. Wellman . . . technology head.

where he was elected Phi Beta Kappa, Mr. Wellman was registrar of Fenn College. In 1938 he was chairman of the campaign which enabled Fenn to purchase Fenn Tower. He also served on the Fenn Corporation representing ore, coal and steamship companies. Subsequently he held the post of publicity director for Cleveland Chamber of Commerce, then that of personnel director for Oglegay-Norton & Co. Among his responsibilities as vice-president of Lake Carriers', was director of the educational program for the association. He was also editor of *Lake Carriers' Bulletin* and was active in the safety program and welfare activities of LCA.

J. P. Holt . . . been talking about basics?

John Hellstrom . . . to bigger selling job.

Kenneth M. Smith . . . about jolt-rockover.

Kenneth M. Smith continues his contributions to the foundry literature with his paper describing the application of jolt-rollover molding machines on page 36. One of two on molding equipment that he presented at the 1952 International Foundry Congress, the paper will appear in a symposium on molding methods to be published early in 1953. Foundry engineer with Caterpillar Tractor Co., Peoria, Ill., since 1944, Mr. Smith has been with the company since graduating from the University of Illinois as a mechanical engineer in 1939. He has presented a number of papers on foundry production methods and equipment and on foundry dust control.

George E. Isabell has been appointed Mid-west sales representative for Foundry Products Dept. of Borden Co., New York. He was employed in a similar capacity by National Foundry Sand Co.

John J. Watson, formerly manager of C. O. Bartlett & Snow Co., Detroit, has been appointed manager of all sales activities of B & S foundry equipment. He will headquarter in the company's home office in Cleveland. L. F. Harding, until recently of Harding Engineering Co., Detroit, has joined M. E. Dawson in the Detroit sales office of Bartlett & Snow.

A. S. Blodget, Jr. is the new Pittsburgh district manager for Air Reduction Sales Co., New York. **E. S. Twining, Jr.,** formerly assistant sales manager of the company's Philadelphia district, succeeds Mr. Blodget as manager of the Boston district. The changes were made following the death of **S. D. Edsall,** former manager of the Pittsburgh district.

John Hellstrom, vice-president of American Air Filter Co., Louisville, Ky., has been appointed director of sales of all AAF and of Herman Nelson products (which recently moved to Louisville from Moline, Ill.) He will be assisted by **Robert W. Nelson,** vice-president, formerly of the Herman Nelson division. Mr. Helstrom returned to Louisville from San Francisco, where he had organized and managed the company's Pacific division.

John P. Holt writes again on basic refractories, outlining the elements of their application, production, and properties in an article starting on page 63. His last American Foundryman story, "Basic Cupola Operation," appeared in the January 1952 issue. Sales engineer with Basic Refractories, Inc., in the organization's Gary (Ind.) office, Mr. Holt joined Basic in 1950, leaving Midvale Co., Philadelphia, where he was superintendent of melting. He has an undergraduate degree in chemical engineering and an M.S. in mechanical engineering from the University of Pennsylvania.

W. C. van Dyck has been advanced to assistant manager of education and training at Caterpillar Tractor Co., Peoria, Ill. Formerly supervisor of college graduate training at Caterpillar, he will continue to direct this work as part of his expanded duties. A former trainee himself, van Dyck joined Caterpillar in 1938 after his graduation from the University of Vermont. Another promotion at Caterpillar was the naming of **Ralph J. Furstoss** as assistant director of research. In his new post he will have charge of tractor and earth-moving research projects. Mr. Furstoss became a field engineer for Caterpillar shortly after he completed their college graduate training program. Subsequently, he was made supervisor of field engineering, the job he held prior to his most recent assignment. **V. Z. Pavlenko** has been named assistant export divisional manager for the company. He will assist **Jean Walker** in administering export sales activities in Africa, India, Pakistan, and in other countries throughout the Middle East.

H. E. Fellows has joined Lester B. Knight & Associates, Inc., Chicago, as manager of surveys. Mr. Fellows started in the foundry field in 1920 and has been associated with Sampson Tractor Co., with Webster Electric Co., and with Milwaukee Foundry Equipment Co. as sales manager, vice-president, and general manager. **Clifford O. Boyce** has been named assistant manager of the Knight construction engineering division. Mr. Boyce has been practicing in Chicago since 1938.

Woodrow B. Kirkland has been appointed Purchasing agent for Baroid Sales Div., National Lead Co., Houston, Texas. He succeeds **James J. Doyle** who has been promoted to distribution manager of the division.

William G. Cole has been assigned to the sales staff of the Chicago office of Bohn Aluminum & Brass Corp. He has been associated with Bohn as an industrial engineer since 1950.

George W. Roper has been named assistant technical director of the dust and fume control division at Wheelabrator & Equipment Corp. Mishawaka, Ind. He has been with Wheelabrator more than six years, first as sales engineer, and lately as a project engineer.

Samuel S. Kistler, engineer and authority on abrasives, has accepted the post of research associate with Peninsular

continued on page 45

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Lifting Height (hook to ground) - - 138 in.
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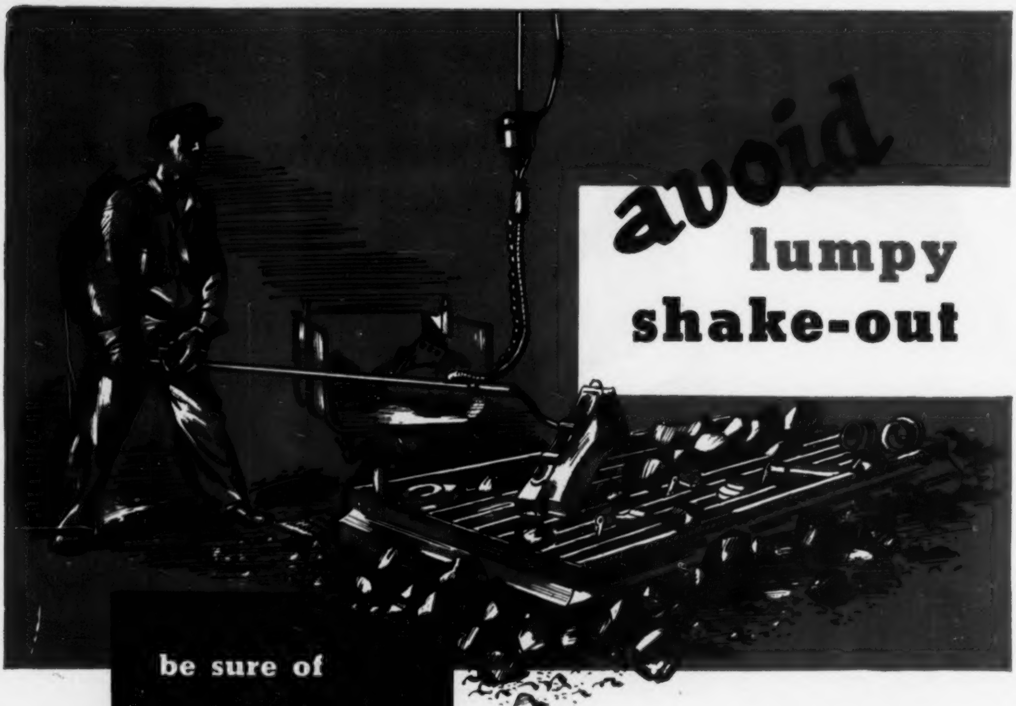

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How's your casting quality?

■ Quality control is practiced by all up to date foundries to some degree. This conclusion is inescapable to those who have heard during the past month the papers on quality control presented at the various regional foundry conferences and read before the annual meeting of the Gray Iron Founders' Society.

Quality control under that name is often viewed with some fear because it has usually been presented to foundrymen in terms of seemingly innumerable charts, graphs, tables, and formulas. While some foundries have found extensive use of "X-bar", R, and P charts valuable, many more plants have shied away from quality control because they don't realize how easily it can be set up and practiced.

Fortunately, quality control by any other name is still effective. Thus, foundries take advantage of the most elementary tests and observations in the interest of producing the maximum number of salable castings. But they don't think to call it quality control. The value of an organized program of quality control lies in the greater likelihood that the program will be practiced continually and expanded to its maximum worth.

An organized program also has obvious public relations value outside the plant and inside the shop it has the effect of creating greater pride in craftsmanship. It would seem worthwhile for all foundries to take inventory of the procedures they now use to assure production of the best possible castings, to correlate them, and to dignify them with the term *quality control*.

In some foundries, quality control consists largely of a study of the defective castings produced. Probably every foundry practices quality control to this extent and almost every foundryman has participated in a scrap meeting of some kind. The best starting point for quality control is the scrap pile, W. J. Sommer, Plainville Casting Co., Plainville, Conn., stated in his GIFS talk on "*Quality Control in the Small Foundry.*" He recommended keeping a record of date, pattern number, customer, total cast, total scrap, and a breakdown showing departmental responsibility and type of defect.

Next logical step is to correlate defectives with condition of the metal, sand, and production equipment at the time the scrap was produced. Simple but effective tests will suffice in some foundries while others will want to go far beyond an occasional chill or fracture test or a daily determination of moisture, green compression strength, and permeability on each sand heap.

Another phase of quality control is the job record card described by Roger W. Griswold, Erie Malleable Iron Co., Erie, Pa., in the September issue of AMERICAN FOUNDRYMAN. Such cards, with their store of information on production details and hazards, are invaluable in a job shop where many castings are turned out only once or twice a year.

Tools for quality control seem innumerable and in the foundries with well-developed programs even production equipment is included. One foundry installed mechanical charging equipment not only to make the work easier but to give the metallurgist greater control over melting operations! This is in marked contrast to the foundryman who, during our consulting days, said he'd rather go back to making sash weights than to have to go to the trouble of having an occasional chemical analysis made.

As casting quality improves, sales go up. As the proportion of rejected castings goes down, costs decrease. The case for quality control is clear cut. It is good that the trend seems increasingly toward broader, more well-defined programs.

For medium and large size castings

Jolt rockover molding machines

KENNETH M. SMITH / *Fdry. Eng., Caterpillar Tractor Co., Peoria, Ill.*

Available equipment and its proper application are stressed in the Molding Machines Symposium sponsored by the Plant & Plant Equipment Committee at the 1952 International Foundry Congress. Shortest of the papers—"Jolt Rockover Molding Machines for Medium and Large Size Castings"—is published here. The entire symposium, covering the full field of molding equipment, will be issued as a separate publication early in 1953.

■ Jolt rockover molding machines are used (1) where it is desirable to place the drag face up on a roller conveyor for doing mold finishing and core setting operations with a minimum of crane work, (2) where it is necessary to draw molds with hanging sand projections which would be difficult to draw by pin lift or rail strip methods, and (3) for making cores.

When making a mold with these machines, the mold can be butted off and then struck off, or a ramming weight can be placed upon the mold to eliminate the butt-off and strike-off operations. When making cores, the strike-off operation will always be required, and the butt-off will usually be required.

Jolt rockover molding machines are available in a range of sizes from portable machines to equipment capable of carrying 40,000 lb total weight through the mold rollover cycle.

While the basic purpose of rockover machines is to invert the pattern or core box above the mold or core for the drawing operation, several types of mechanical motions can be used for this purpose. The machines shown in Fig. 1 through 6 turn the rollover arms vertically through 180 degrees while the machines in Fig. 7, 8, and 9 turn the rollover arms only 90 degrees as the pattern and mold are turned the full half circle. The mold jolt section of the machine in Fig. 9 is similar to the mold jolt section of the machine in Fig. 7.

The machine shown in Fig. 10 has a dual motion in its rollover cycle. After the mold has been made by the jarring machine, the jarring table, pattern, and mold are raised and indexed 180 degrees in a horizontal

Fig. 1 . . . Portable jolt rockover machine combines pin draw with fixed rail conveyor for mold removal.

Fig. 2 . . . Larger jolt rockover unit for permanent installation uses equalizer bars for drawing.

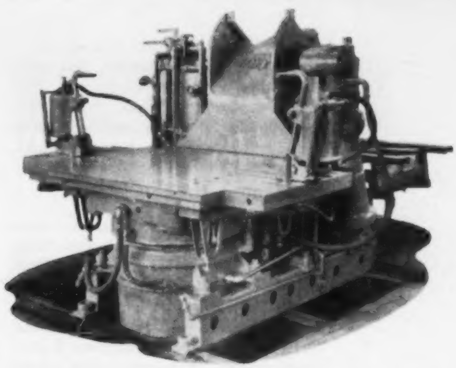


Fig. 3 . . . Stationary type jolt rockover machines has air-operated clamps for holding flask or corebox.

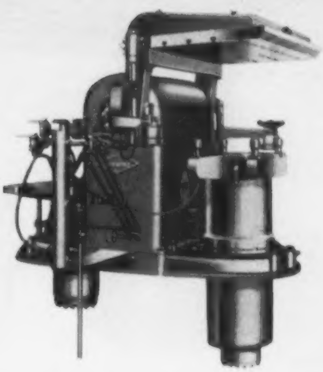


Fig. 4 . . . Large, stationary machine for jolt rockover work shown with table inverted for mold drawing.

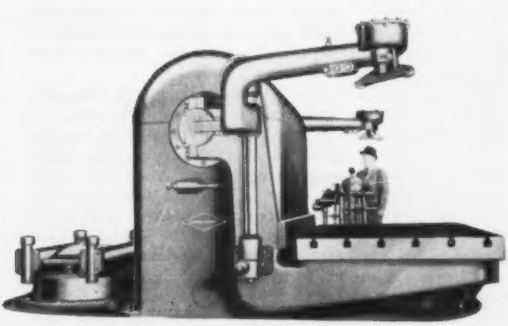


Fig. 5 . . . Man in background indicates the size of this huge jolt rockover machine for making large molds.

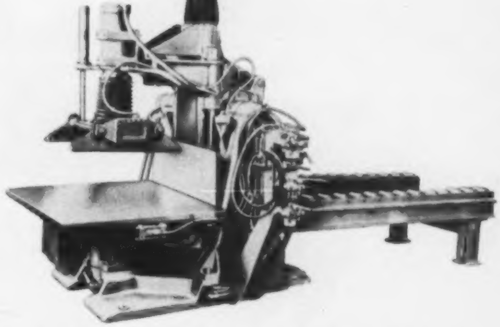


Fig. 6 . . . This jolt rockover machine has the mold drawing mechanism built into the rockover carriage.

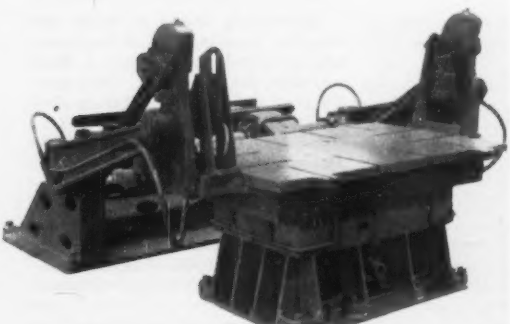


Fig. 7 . . . Unusual molding unit for jolt rockover work turns pattern 180 degrees though carriage turns only 90.

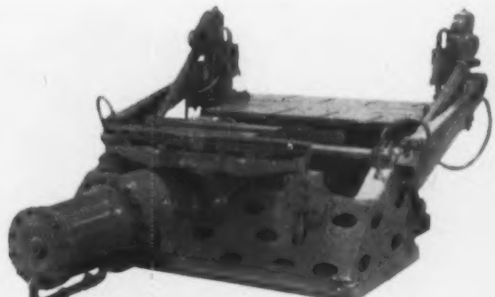


Fig. 8 . . . Opposite side of machine illustrated in Fig. 7 shows mold draw and table rollover mechanism.

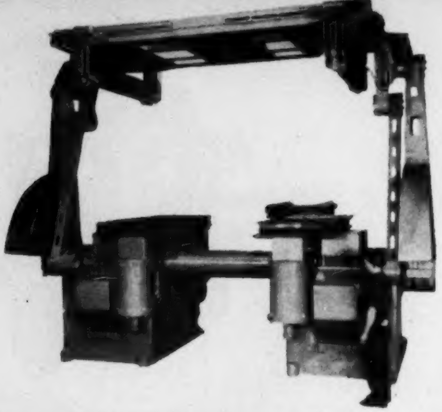


Fig. 9 . . . Mold jolt section of this machine is similar to jolting mechanism of machine illustrated in Fig. 7 but equipment is designed for larger molds.

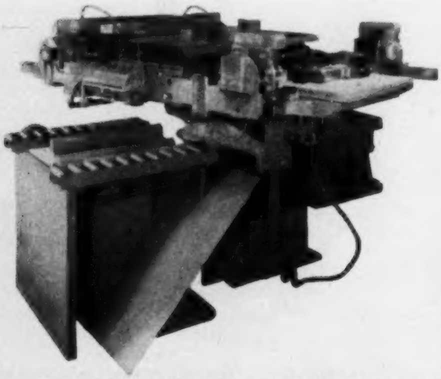


Fig. 10 . . . This machine indexes horizontally between jolt and draw. Mold has already been inverted and is swinging forward to draw table.

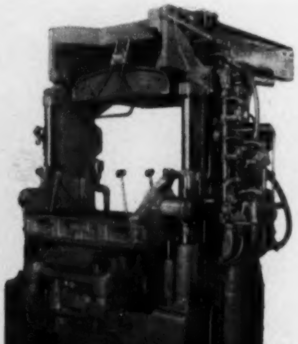


Fig. 11 . . . Though not usually considered a jolt rockover machine, this unit performs typical jolt rollover operations and squeezes in addition.

plane. As the machine indexes horizontally, the table, pattern, and mold are rolled over 180 degrees on the table trunnions. Thus, when the table swings over the mold drawing station the pattern is above the mold.

Two at a time

The draw table equalizer rails are next raised against the mold which is then unclamped, drawn, and deposited on the roll-out conveyor. A second mold can be rammed in this machine while the first mold is being drawn. In Fig. 10, the machine is performing the horizontal index cycle, and the mold and pattern have just indexed 180 degrees about their horizontal axis.

The mold drawing cylinders of the machines shown in Fig. 1 through 5 and 7 through 10 are mounted in the machine base, but in Fig. 6 the mold drawing cylinder is mounted on the rollover arm structure where mold draw accuracy is insured by guided ways built into the rollover arm structure.

The machine shown in Fig. 11, while not strictly a jolt rockover machine, does accomplish a similar cycle of operations plus the mold squeeze operation. After the mold has been jolted and squeezed, the pattern carriage, pattern, and mold are raised to clear the jolt table. The carriage, pattern, and mold are rolled over and lowered until the mold rests upon the equalizing rollers which are then clamped in place. The mold is unclamped from the pattern, and the pattern is drawn out of the mold which can then be rolled out of the machine.

Acknowledgements

The author wishes to thank the foundry equipment manufacturers who provided photographs of their machines for this paper. They are: International Molding Machine Co., La Grange Park, Ill., Fig. 1 and 2; Tabor Mfg. Co., Philadelphia, Fig. 3; Davenport Machine & Foundry Co., Davenport, Iowa, Fig. 4 and 5; Johnston & Jennings Div., Pettibone Mulliken Corp., Chicago, Fig. 6; Herman Pneumatic Machine Co., Pittsburgh, Fig. 7, 8, 9, and 10; Milwaukee Foundry Equip. Div., SPO, Inc., Milwaukee, Fig. 11.

Other papers to be included in the symposium on molding machines include detailed, illustrated discussions of molding machines for light castings, slingers, and special and automatic machines.

A·F/roundtable

Sand inclusions in steel castings

How do sand inclusions get into steel castings was one of the questions seven Texas foundrymen asked themselves at a Round Table sponsored by American Foundryman at the Shamrock Hotel. The first part of their informal discussion, on causes of hot tears in steel castings, appeared in the September issue of "The Foundrymen's OWN Magazine."

Participating in this American Foundryman Round Table were: C. E. Silver, Texas Electric Steel Casting Co., Houston, chairman; C. L. Boone, Texas Steel Co., Ft. Worth; Lloyd O. Sturkie, Quality Electric Steel Castings, Inc., Houston; Gerald E. Smith, Smith Steel Casting Co., Marshall; O. M. Bartholomew, Hughes Tool Co., Houston; C. K. Flagg, Ross-Meehan Foundries, Chattanooga, Tenn.; and Robert Dilbeck, Texas Steel Co., Ft. Worth.

Silver . . Are sand inclusions introduced into a casting through improper gating, furnace practice, ladle practice, improper blowing out of molds, or improper facing sands? We all have need for determining the answer from time to time.

Bartholomew . . If an inclusion results from furnace practice or ladle practice, I believe it would enter the casting in the form of slag rather than sand. So it boils down to dirt in the mold, a wash in the gate, or trouble with facing.

Silver . . Are we agreed that we can differentiate between sand inclusions and slag inclusions at all times?

Smith . . I think so.

Sturkie . . I don't think so.

Smith . . Sand and slag are distinctly different. Of course, you are going to have some loose sand in the mold that's on the verge of becoming slag.

Dilbeck . . When the metal hits some loose sand in the bottom of a mold the sand will vitrify. When that happens, I don't believe the distinction would be clear cut.

Silver . . You feel that it's difficult to distinguish between a sand inclusion and a slag inclusion?

Dilbeck . . Especially in acid steel.

Bartholomew . . I don't think sand from the mold is really going to form a slag. You may have fused sand that borders on slag, but I believe you can differentiate between it and slag from the ladle or furnace.

Silver . . Should we confine our discussion to inclusions that are obviously caused by sand?

Smith . . We'll lose an important part of the discussion if we do because there are inclusions in castings that must be pinned down to the ladle, the furnace, gating, or the mold.

Sturkie . . I'm especially interested in the type of inclusion which customers call sand holes. We're all pretty familiar with them and with what a customer means when he calls to say "I busted some tools on sand inclusions."

Flagg . . If we limit the discussion to sand will that eliminate ladle practice?

Silver . . I don't think it will because the ladle may be lined with sand.

Sturkie . . You have to patch with sand many times.

Silver . . How many times when a customer tells you he's got sand, blowholes, or shrink in a casting, can you tell whether it's sand, blowholes, or shrink?

Sturkie . . Usually, if serious enough, we send someone from our plant to view the defect. We generally find it is sand. These defects are, we think, introduced into the casting through our sprue or gate. Our practice is to use tile and core sprues. Our gate runners on large castings are usually tile.

Smith . . Do you feel that it's necessary to use tile down gates on castings weighing 500 lb and under?

Sturkie . . It depends on the type of casting. If the casting has to be completely free of sand, whether it weighs 100 lb or half a ton we use tile sprues.

Boone . . Regardless of weight, doesn't it depend on the metal section more than anything else whether you use a tile gate? If you have a 100 lb casting with an inch or two section, you'd use a tile gate wouldn't you?

Sturkie . . We don't figure it that way. We figure by the amount of metal that has to flow through the gate and the distance it has to travel.

Flagg . . Mr. Dilbeck's company has made a real effort to determine whether they are getting some of their sand inclusions out of the ladle. I wonder if they've reached any conclusions.

Dilbeck . . Nothing definite. I think that you normally wouldn't get any sand from the ladle because by the time you tap the heat and get over to the mold for pouring any loose sand would have come up and combined with the slag.

Smith . . A permanent mold of graphite has been made into which 125 to 150 lb of steel were poured through the nozzle. There was no sand in the mold but sand was found in the casting. Where did it come from if not from the furnace or the ladle?

Bartholomew . . Was any kind of a wash used on the mold?

Smith . . No wash whatsoever. The metal could have picked up a little carbon but it didn't show in the chemical analysis.

Sturkie . . Do the inclusions come from opening the ladle on the first pour?

Smith . . Most of them come at the

opening of the ladle, but you can get them all through the heat if the ladle is in bad condition. In my opinion, we are getting non-metallic inclusions from the ladle as the lining deteriorates. This is caused by the well being too deep, leaving a sharp edge on the embankment which can wash off. We corrected it by lowering the bottom.

Boone . . Were the inclusions on the cope side?

Smith . . Yes. The permanent mold had a cope and was poured through the riser. Take a machine bit off the casting and there is the inclusion. Whether it is sand, clay, or refractory it has that same glassy, white appearance and machinists say they cannot find a tool that will cut it.

Boone . . Did you say you poured that casting at your place? How did you make the mold?

Smith . . Not at the plant I'm with now. We just took a large electrode, say 24 in. in diameter, bored out a mold cavity, made a cope, and dowelled the two together. We poured through the riser.

When your customers are complaining about sand, you pour one of these molds and you'll find the inclusions. Many times you run to the molder when sand inclusions show up in the castings and tell him he's closing carelessly or that his cores are bad.

Bartholomew . . Sometimes the molders claim the molds are clean, but I've gone out into the foundry and opened molds with them and taken a tablespoon of sand from a mold that they claimed hadn't a speck of sand in it.

Smith . . The condition is worse near the beginning of the heat and improves and finally clears up near the end. In my opinion the trouble is with the ladle. I've seen it in three foundries so far, though not in the one I'm with now.

We ran analyses on some of the inclusions and they were approximately 70 per cent silica and 10 to 15 per cent iron oxide. On acid electric steel poured in skin-dried molds it's difficult to tell where these inclusions originated. With the relatively low specific gravity of silica compared to steel, and the reaction of ladle additions, it seems to me there should be a tendency to move loose ladle refractory to the slag level. There's usually three to five minutes from tap to start of pouring, and similar inclusions have been found in 100 to 200 lb castings near the cope surface. This indicates that there is time and a tendency for the upward drift to occur.

Flagg . . Dirt must come from the ladle. The ingot manufacturers have the same problem and they get inclusions though they pour into cast iron ingot molds. When they have an especially particular job to perform, they demand ladles lined with brick only.

Smith . . Ingot experience gave me the idea for the graphite mold. If the ingot people have the same trouble as we have with sand molds, then the source must be something besides the mold.

Silver . .We know the ingot producers have trouble because our customers have shown us where they have found sand inclusions in forgings. Now we've agreed we can look to ladle practice for inclusions. Can we go back farther than that?

Smith . . Pour directly from the furnace into the graphite mold.

Silver . . Aren't you apt to get sand from the spout of the furnace?

Smith . . If you do you'll improve your spout. We blow ours off with an air hose before we tap out.

Flagg . . We've talked about tile down gates but what about runners? We don't use tile runner gates nearly as much as we do down gates.

Sturkie . .We use a tile bottom that takes all the shock. We have a T-type gate that takes the actual impact and that seems to be more important than the down sprue.

Smith . . Have you ever checked the tile after you've poured a casting? Is the down gate in the tile smooth or do you sometimes have a wash or cut?

Sturkie . . I don't think the roughness is due to washing. You don't get a slick surface, but something like you get from pouring steel against a flat brick. I believe it's due to the fact the metal won't lie on the brick.

Smith . . My experience has been that you get spalling of the brick if you use it at the bottom of a down gate. Naturally, it's going to wash right into the mold cavity. On heavy castings you've got to use brick or tile, but on lighter castings you can make a good, stiff sand that will stand up better on up to 2,000 lb of hot metal than a tile or brick down gate. Up to 2,000 lb of metal we use sand only for the gate.

Sturkie . . But can you get consistency out of your sand gates? Tile ought to be more reliable.

Silver . . Don't you think the tile manufacturers are more accurate in their refractory mixtures than we are in preparing sand for molding?

Smith . . They are.

Silver . . Tile manufacturers are making knock-off cores which can be purchased as standard items. I understand though that you're going to run into trouble if you don't store them in an oven. I don't imagine any of us are storing our tile down gates in a core oven, or in a warm place where we're sure all the moisture will be driven out. We may be missing a bet on that.

Flagg . . Is there any opinion as to whether a dry sand core is better than a brick down gate? Seems to me you will have less wash from vitrified sand that has some plasticity because it softens at the temperature of the molten metal. If it doesn't actually erode, it is a better surface for the metal to flow against than almost anything you can think of, especially brick that would tend to spall.

Boone . . Isn't it possible that the steel is forming a skin around the walls of the sprue next to the sand while the rest of the metal flows down through the center.

Smith . . That's the best thing you can do—have steel flowing against steel.

Boone . . I know a plant in California that used cores for down gates quite successfully for a long time. They made the cores, dried them, then filled them with mold wash to coat the inside. Their gates looked very clean, much cleaner than some I saw in other foundries that were using tile gates. After a year or so the foundry went back to tile because they decided it was cheaper to buy the tile than to make the cores.

Smith . . We do a lot of bottom gating

by just laying a split brick over our gate after cutting it. After we noticed trouble from spalling we switched to slab cores made in our core room and I believe we're getting better results.

Sturkie . . Much of the sand, I think, is introduced into the casting when you first open the stopper. There's a tremendous impact and for that reason alone I'm partial to tile.

Boone . . Don't you think you have more trouble of that type from bottom-pour ladles than from teapot or bull ladles?

Smith . . All my experience has been with teapot ladles except one year when I used bottom pour ladles. You get as much slag, but I believe you can find it better in castings poured from a teapot than from a bottom pour ladle. The teapot slag seems to have a different composition and to stay together better. It doesn't go all through the casting but appears just in one or two spots.

Bartholomew . . It's a slag inclusion.

Smith . . It's a slag inclusion then. You don't have any trouble distinguishing it.

Boone . . The segregation of the slag is probably due to the absence of the pressure you exert on the mold when you use the bottom pour ladle.

Smith . . Correct. You do not get as much washing in the gates from lip pouring as you do from bottom pouring.

Flagg . . Probably we could take a lesson from the cast iron and nonferrous people. They make it a definite point to keep their down gate and runners full. Steel foundrymen have not made such a point of that, and if a runner is not kept full, the upper side has a tendency to deteriorate. The sand burns out, drops down, erodes, and gets penetrated by metal. If the down gate is kept full, it will not erode nor introduce nearly as much sand into the mold cavity as when it's left partly open.

Smith . . On my down gates you cannot do much about that, but on the runner you have a flat surface in the cope. When you get cutting of the sand, I believe it's caused more from expansion than it is from cutting by the metal. To eliminate that when possible, we split our gate, half in the cope and half in the drag. The flat surface is more likely to flake off than the curved surface.

Bartholomew . . One factor we haven't covered is facing sand. I think the material we cover our patterns with enters into this discussion on inclusions and so does mold wash. The facing should be hard rammed, especially around the gates and wherever the metal is going to enter the mold. Poor facing sand will be just as bad as a soft-rammed mold.

Sturkie . . Moisture content of facing sand is critical. Sand mixed with high moisture causes trouble. Our practice on skin drying sand is to try to hold our moisture at between 3 and 4 per cent. In this range we stay out of trouble. But if our moisture goes over 5 per cent we usually have trouble.

Bartholomew . . We use a little higher than normal moisture in our practice; in some instances it runs around 5 or $5\frac{1}{2}$ per cent for skin drying. This is for a special purpose and we bake it about 20 minutes under infra-red lamps.

Silver . . We've all seen sand or dirt inclusions that come from the wash and it's quite evident that the wash has dropped off the mold leaving flakes in the castings.

Bartholomew . . You can look into a mold during pouring and lots of times you'll see mold wash flaking off. When it comes off it's going to pull some sand with it. In fact, I've seen molds after they have been washed setting out in the open; the wash dried and curled up.

Boone . . Here's another source of trouble. I've known fellows to use too much dry parting compound. They put it all over the patterns, cover with facing, ram, then draw the pattern and wash the mold. The parting causes the wash to flake off like eggshells.

One foundry tried to overcome this by encouraging the molders to use as little of the dry parting as possible and to brush it or blow it off before applying a wash. It didn't work so they finally eliminated dry parting and used a liquid parting or kerosene.

Smith . . How was the wash applied?

Boone . . With a spray or by swabbing on with a rag.

Flagg . . We used silica flour for parting for many years in addition to a wax coating on the patterns. We wanted to get rid of the silica flour because we felt it was a silicosis hazard but couldn't use other parting compounds for the reason Mr. Boone gave. So we just went to a fine grained sand for a parting.

Bartholomew . . I believe density of a wash has a lot to do with whether it will cause inclusions or not. We are particular about the Baumé of the wash on certain castings.

Silver . . Ours is kept between 46 and 49 degrees Baumé.

Smith . . If the wash can penetrate and get a better hold on the mold it will not flake as much.

Sturkie . . I think the type of wash makes a difference. Some have an organic base, some an inorganic base. The organic material will probably bond a little better to the sand grains than an inorganic material. That has quite a bit to do with the thickness of the wash, I think. And so does the grain size of the sand.

Smith . . One of the best tests you can make after spraying a mold and before drying is to pick out a little part of the mold to see how deep the wash has penetrated. After drying, see whether the wash is going to stick or whether you've just covered the top by brushing with your hand. If you can flake it off with your hand it's certainly going to flake off when heated.

Silver . . I believe we have brought out a lot of factors which contribute to sand inclusions in steel castings. Most foundrymen trace these inclusions back only as far as the molding floor and the core room. Our discussion has brought out the need for going back to ladle and furnace practice, sources of dirt that often are overlooked.

▶ *Battelle builds in Europe*

Battelle Memorial Institute, Columbus, Ohio, has started construction on a research center at Frankfurt/Main, Germany, to serve the industry of that country. Battelle centers at Geneva, Switzerland, and other Western European countries are also contemplated. Staffs of new units will be predominantly Europeans. American industries in Europe and European industries and governments will pay costs.

Action by A.F.S. Committees stress safety in foundry practice

■ Meeting in Chicago October 8 the A.F.S. Steering Committee discussed legislation recently introduced in Washington relating to industrial safety. It was reported that the National Founder's Association has written to the Senate Hearing Committee objecting to passage of these bills on grounds that they are inequitable and impractical. At present writing the bills have been returned to the Committee for revision.

Because of a recent ruling by the Department of Labor on the subject of noise, the Committee recommended that information be compiled on suitable means of measuring foundry noises and to survey noise sources and suggest methods of noise control.

Other recommendations had to do with finding ways of labeling all hazardous materials used in foundries, and to obtain information on foundry illumination. These findings are to be included in the Good Practices Manual now being revised. Also recommended was the development of a manual on safety, hygiene, and dust control in woodworking.

Manuals in process

The Safety Committee is revising the manual, *Recommended Good Safety Practice for Foundry Workers*, and has compiled a training course on fundamentals of foundry safety practices. Other Safety Committee activities include the preparation of programs to be presented at the Universities of Illinois and Wisconsin.

The Dust Control and Ventilation Committee reported that parts of the Dust Control and Ventilation manual are completed, and that the proceedings of the conference on Health Protection in Foundries now are available in book form. The book includes papers by 19 experts on industrial health in steel, gray-iron, and non-ferrous foundry operations. It describes causes and prevention of diseases common to the foundry.

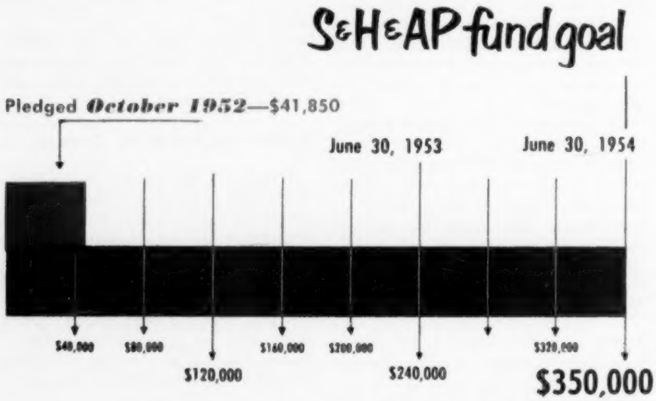
Present at the Steering Committee meeting were J. R. Allen, chairman, International Harvester, Chicago; Dr. J. H. Chivers, Crane Co., Chicago; F. C. Fluegge, International Harvester; A. G. Granath, National Engineering Co., Chicago; J. M. Kane, American Air Filter, Louisville; F. A. Patty, General Motors Corp., Detroit; J. C. Radcliffe, Ford Motor Co., Dearborn, Mich.; Wilbur J. Smale, Michigan Mutual Liability Insurance Co., Detroit; Kenneth M. Smith, Caterpillar Tractor, Peoria, Ill.; C. C. Sohl, American Steel Foundries, Chicago; J. W. Young, International Harvester, Chicago. Other members of the committee are C. K. Faunt, Christensen & Olsen Foundry, Chicago; H. A. Forsberg, Continental Foundry and Machine Co., East Chicago, Ind.; Dr. L. E. Hamlin, American Brake Shoe Co., Chicago; Dr. Dudley A. Irwin, Aluminum Co. of America, Chicago; W. O. Vedder, Pangborn Corp., Hagerstown, Md.

Surveys being made

A code, designed for adoption in a manual, *Recommended Good Practices in Welding Operations for the Foundry Industry*, has been drawn up by the Welding Committee. The Air Pollution Committee is organizing a survey to enable foundries to define air-pollution problems and establish measures of control.

Closely allied is a study listing typical foundry operations involving dust and air-pollution problems, average emission rates, and a composition of pollutant for each process. The lists will be included in the manual on Foundry Air Pollution, now being prepared.

Air Pollution Committee members present included: F. A. Patty, chairman, General Motors Corp., Detroit; Kenneth M. Smith, Caterpillar Tractor, Peoria; E. M. Adams, Dow Chemical Co., Midland, Mich.; G. L. Burnside, Ford Motor Co., Dearborn, Mich.; J. M. Kane, American Air Filter, Louisville; Richard B. Engdahl, Battelle Memorial Institute, Columbus, Ohio; W. H. Williamson, American Wheelabrator & Equipment Co., Mishawaka, Ind.; H. L. Rekart, National Steel Castings Co., Cicero, Ill.; Claude B. Schneible, Claude B. Schneible Co., Detroit.



Contributions and pledges to the S & H & AP Program fund up to October 30 total $41,850 as shown at left. Most recent contributions ($500 each) were made by Gibson & Kirk Co., Baltimore, Md., and the American Air Filter Co., Louisville, Ky.; Leslie Co., Lyndhurst, N. J., added $29.60, and an anonymous donor gave $274.00.

Well-engineered ventilation system

Keeps bearing foundry in business

J. C. SOET / *Acting Director, Division of Industrial Health, Michigan Department of Health, Lansing, Michigan*

Value of an effective exhaust system, and the way in which a state agency can help foundrymen solve their foundry health problems, are brought out in this paper condensed from a presentation made at the 1952 Industrial Ventilation Conference held at Michigan State College.

▪ About six years ago a lead outbreak occurred in a non-ferrous foundry in Michigan, and major exhaust installations were made to control the lead fume and to maintain the lead concentrations below the toxic limit. A subsequent increase in production made the original installation obsolete, and stopgap methods had aggravated the toxic condition. The plant now casts 3000-4000 lb of bearing bronze daily, with a lead content of 20-30 per cent.

About two years ago half the employees had high lead absorption and were under a physician's care. At that time, in cooperation with the company, the Division of Industrial Health, Michigan Department of Health, took steps to solve the problem permanently.

Housekeeping not enough

A preliminary survey of the foundry brought out two interesting facts. Housekeeping was excellent and tended to deceive as to the air contamination that existed. Usually, the physical appearance of a plant is a tip-off on the effectiveness of the ventilation system. In this case, however, the opposite was true. Ventilation control measures were not consistent. While excellent control existed at some operations, other operations had no control at all.

Figure 2 shows a plan view of the foundry layout and exhaust system at the time of the first study, before any changes were made. At the top is the smelter room, with three tilting furnaces located along the west wall. These furnaces had individual circular hoods with ducts running up and joining at the center of the roof at the roof fan. This fan was not in operation, and the thermal lift from the heat of the furnaces provided the only air movement through these hoods and ducts.

The two furnaces located on the east wall are used for pre-heating crucibles only, and as far as lead-in-air was concerned, were unimpor-

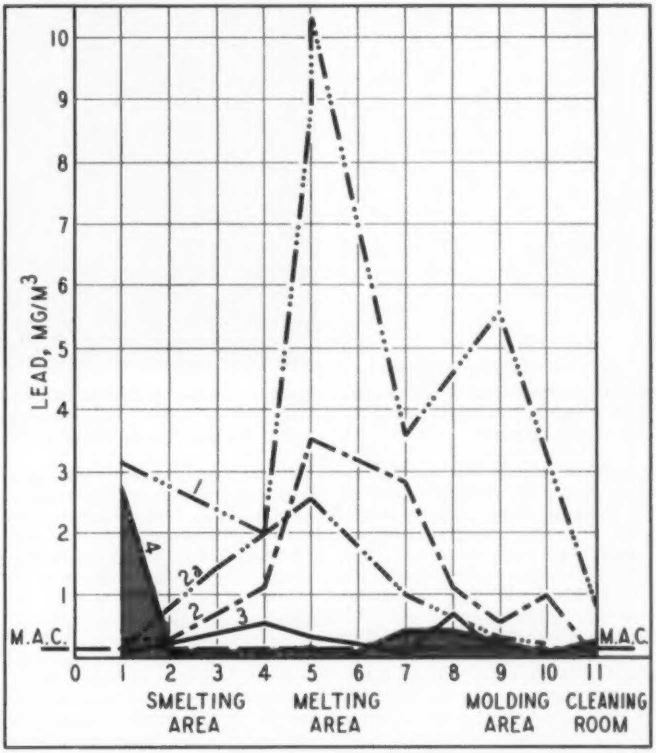


Fig. 1 . . . Analyses of air samples taken at five different stages in development of the ventilating system. Samples were taken throughout the plant. M.A.C. line at bottom was the goal. Excessive reading at left of Line 4 was caused by faulty handling of equipment, and is not indicative of the results obtained.

tant to any overall consideration of the problem.

After the metal is smelted in the three furnaces it is poured into crucibles and moved into the next room by a monorail to the ingot pouring operation. Pouring was hooded, with ducts running to a roof fan. This ventilation control was acceptable.

After cooling, ingots are removed from the molds and placed in crucibles which are then lowered into the furnaces to left and right of the ingot molds. Crucible furnaces on the west wall were hooded by metal drop curtains in the rectangular shape shown by the broken line on the drawing. They came to within 12 ft of the floor. This curtained area was exhausted by two roof fans. The bank of furnaces along the east wall was not hooded and had one general roof fan directly above.

After being heated to pouring temperature, the metal is moved to one of the two dross pots. These drossing stations were hooded (Fig. 3) in a rather unusual manner; ducts ran directly up to the roof fans. These two operations were well controlled when the hoods were properly used.

Traveling again by monorail, the metal is then moved to either of the two pouring stations. All molds are made up in the molding area and roller conveyed to these pouring stations. Both were hooded by side-draft hoods which did a satisfactory job of fume removal.

After being removed from the molds, the castings are conveyed to the cleaning room directly west of the pouring area.

There were several provisions for general ventilation in this foundry. Two general roof fans were in the molding area. A general wall fan was located along the east wall in the molding area, with another in the cleaning room's south wall. A third general roof fan had been installed between and just south of the dross pots. There were two more such fans between the drossing pots and the ingot operation.

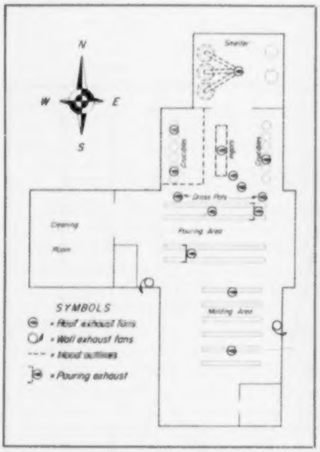


Fig. 2 . . . Plan view of the original plant layout and exhaust system at time of first sampling.

Fig. 3 . . . Drossing stations were hooded in this unusual manner. Ducts lead directly to roof fans. This operation was well controlled when the hoods were used in the proper manner, adding little to lead content in the air.

All these were misguided attempts to provide sufficient general ventilation. They merely contributed to the widespread contamination by creating air disturbances carrying metallic fumes to all areas of the foundry.

Make air analysis

First step in the investigation was to take air samples throughout the entire plant. This was done for two reasons: it gave definite information on the extent and magnitude of the contamination and the location of the contaminating areas; and it gave a reference line which could be referred to in later air analyses.

Figure 1, line 1, gives the analytical results of these first air samples. Lead concentrations are plotted along the vertical axis; horizontal axis shows the locations at which lead samples were taken, running from the smelting room through the cleaning room in the same order in which the metal progresses through the plant.

The melting area in the crucible furnace room had the highest concentration of lead. At one point it ran as high as 10 milligrams per cubic meter. Next highest concentration was in the molding area; it ran over five mg per cubic meter. Third highest was in the smelting area, with about three mg per cubic meter.

The maximum allowable concentration for lead is shown by the heavy broken line, just above the horizontal axis and labeled M.A.C. on each end. Analysis on all samples showed that lead concentrations were far above this limit. The objective, therefore, was to bring the concentration of lead in air at all the operations throughout the entire foundry down to that heavy broken M.A.C. line.

From these analytical results the attack was planned and the first steps in positive ventilation control taken. Figure 4 shows the recommendations made. In the smelting room, a hood was placed around the whole west bank of units; this was done by simply dropping a curtain from the north wall to the south wall. The fan that was originally in the center of the room was moved directly above the furnaces. There was no need for ducts, since the curtain extended to the roof.

The installation of sheet metal curtains to act as a hood around the east bank of crucible furnaces was

also recommended; this is shown by the broken line around these furnaces on Fig. 4. For more effective exhaust capacity, the general wall fan which was located in the molding area was moved into position under the east hood.

To provide additional exhaust, the wall fan formerly in the cleaning room was switched to the wall under the hood at the west bank of furnaces. Meanwhile, one fan near the ingot operation and the two in the molding area were removed.

Relocating and removing these general exhaust fans accomplished two purposes. It increased the amount of air exhausted at the operations needing additional fan capacity, and it eliminated the unsatisfactory existing general ventilation measures.

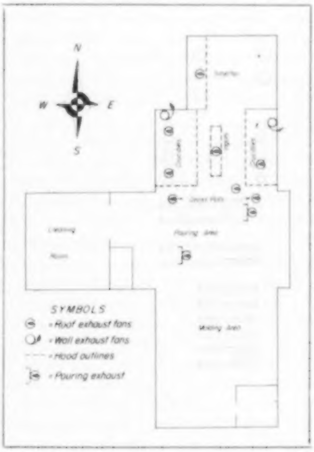


Fig. 4 . . . Analyses of air samples lead to these recommendations. Result was Line 2 on Fig. 1.

A planned air supply

To determine the effects of these changes, another series of air samples was taken at the same locations as those used in the first study. Figure 1, line 2, shows the considerable reduction in lead concentrations, especially marked in the smelting, molding, and melting areas. However, there was still some distance to the M.A.C. line, especially in the melting and molding areas.

The metal curtains around the east and west banks of crucible furnaces had been installed to extend from the roof to within 12 ft of the floor. These were now extended to within 6½ ft of the floor. To determine what effect this downward extension of the hoods had on lead-in-air concentrations, another series of air samples was taken. Results are shown in Fig. 1 by line 2-a. In general, lead concentrations moved farther down toward the M.A.C. line.

At this stage it was suspected that leakage was occurring from the furnace hoods through the openings provided for the monorails, and that a solid baffle or skirt as shown in Fig. 5 across the southernmost end of the furnace area would help. This baffle did not disturb operation procedures and handling methods. It separated the drossing and pouring operations from the furnace area.

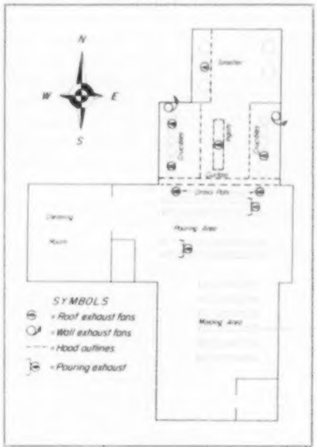


Fig. 5 . . . Air sampling shown as Line 2a on Fig. 1 lead to these additional recommendations.

It was felt that installation of this baffle would nearly complete the work, so another series of air samples was taken. This time doors and windows were opened to simulate air make-up facilities, to see what effect this would have. It had been suspected from the first that not enough air was being introduced into the building to satisfy the exhaust fans, and the suspicions were well-founded. Results (Fig. 1, line 3) were right in on the M.A.C. line and almost parallel to it.

During the summer months, plans were formulated to provide tempered outside air to the plant. It was decided that about 15,000 cfm of tempered air should be supplied in the extreme south end of the foundry, as shown in Fig. 6. The balance of the make-up air was allowed to enter the smelter and furnace room in the northern end of the building along the north and east walls, as shown by the long broken arrows in the smelter room.

Tempered air supply system was installed and operating during the cold weather, and in November the last series of air samples was taken. Results are given in Fig. 1, line 4. The one high sample in the smelter room was due to poor handling technique, but the line paralleled and almost coincided with the M.A.C. line. After four major steps and groups of recommendations, the objective had been reached.

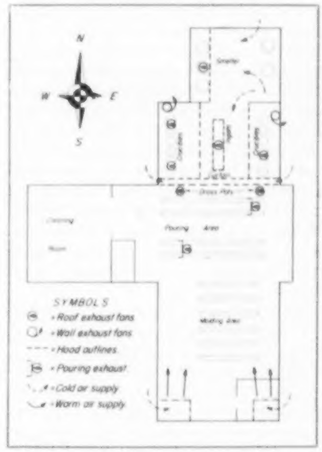


Fig. 6 . . . Last step was to provide for feed of tempered make-up air to the foundry.

One of the interesting sidelights to the air supply problem concerns recirculation of the exhaust gases. Installing recirculating equipment was considered, and a bid submitted for units with an assured collection efficiency of 90 per cent. Air samples of the effluent gases from the furnaces showed an average concentration of lead fume of 4.5 mg per cubic meter. It was immediately evident that 90 per cent removal would still leave the air far above the maximum allowable limit, and the proposal was abandoned.

Consider air movement

It is significant that the whole foundry was originally considered in terms of one complete air movement system, the reason being that the exhaust system at one operation cannot be isolated from the exhaust

system of another. Working with air movement in open areas, the movement at one operation affects air movement throughout the whole area. It is rarely possible to calculate industrial exhaust systems on the basis of local or isolated problems. It is a matter of integrating all the air movement factors in one open area into one exhaust system.

Segregate operations

Originally there was no segregation of operations in this foundry. It was only after it was found advantageous to set up two completely separate systems that a barrier from wall to wall was installed, segregating furnace operations from all other areas in the foundry. The reason for its installation is simple. The thermal lift and the sudden expansion of air created by the heat from the furnaces in the crucible and smelting room disturbed the whole airflow pattern in the foundry. The barrier prevented this disturbance from affecting the exhaust and airflow patterns in the molding and pouring areas.

Another point is the importance of air supply. As soon as sufficient make-up air was introduced into the building, lead in the air showed a marked decrease—in other words, the control was improved with no changes or alterations to the exhaust system. It is absolutely necessary to bring as much air into a building or area as is taken out. This point may seem obvious, but unfortunately there are many elaborate and expensive exhaust systems which are not working effectively because of this factor.

One strong reason for not bringing in enough air is the cost of tempering or heating make-up air in the colder months. Discharging 1000 cfm of tempered air to the outside costs about $50 a heating season. This is a serious item to consider in exhausting thousands of cubic feet of air, but in general it is unavoidable. Naturally, recirculation or the use of heat generated by some process can be employed.

Recirculation of air by means of a collector can avoid the cost of heating outside make-up air; however, collector systems for toxic materials are rarely able to remove toxic contaminants to the point where recirculated air can be used safely. This objection obviously does not apply in the case of non-toxic materials.

This brings up another reason for erecting the barrier; it effectively limited the amount of tempered makeup air needed. The heating unit at the south end of the foundry tempered only that amount of air demanded by the exhaust fans in the pouring area plus that required to insure a flow under the baffle to the melting area. Radiant heat emanating from the furnaces was used to heat the necessary make-up air for the furnace and smelting rooms, which reduced the cost of heating make-up air by over half.

The south wall of the foundry was chosen as the entry location for the make-up air. In this way the uncontaminated air would flow over the largest number of workers in the plant—those in the pouring and molding areas—up to the hoods over the operations where there was considerable lead given off. In this way no air currents could carry leaded air to the workers.

Evaluating the system

Remember that the effectiveness of this industrial exhaust system was not measured by the quantity or velocity of air being exhausted. These factors are considerations in the design of an exhaust system, but they are not the basic factors to consider in evaluating the effectiveness of a system. The value is judged by the amount of contaminant left in the air.

The steps by which this system was installed were the economical, practical, and fool-proof method of accomplishing the ultimate purpose. It was demonstrated to the company that results were being attained in the process, and that it was being done in the least expensive way possible. It is not always practical to make all the major changes and installations at one time. Production schedules and finances often require a slower, judicious approach.

Good practices in industrial ventilation have tangible rewards. They are effective tools in maintaining a high rate of production, a high standard of quality control, and lower maintenance and depreciation costs. In this case, the industrial exhaust system kept the company in the bearing business. It would not have been able to continue in business under the former conditions.

This would have been true for compensation costs alone. In fact, the compensation carrier watched the step-by-step progress, and it was only because of the good control results that they continued to insure the bearing company. There was also a definite increase in production because of better working conditions. These conditions also resulted in improved quality control—fewer rejects and better all-around operation throughout the company.

Counting the cost

Exhaust systems are equally important in maintaining a good eye skill which is an essential factor in high production quality control. There is no more effective method than the removal of dusts and fumes from industrial operations to utilize eye skills to the best advantage. Frequency of breakdowns and high maintenance and depreciation costs are directly related to exhaust systems.

Although air itself is free, the cost of using it may be high. Costs of exhaust installations should be considered as well as the principles of design. Exhausting should be done as effectively and as inexpensively as possible.

A few examples will bear witness to this. Recently the Industrial Health Division worked on a proposed system for exhausting a pugmill mixer. The proposal called for a canopy hood with a capacity of 8000 cfm. By enclosing and making a direct connection to a top opening and partially encircling the barrel filling opening, the amount of air was reduced to 800 cfm. The company had been concerned about the loss of material, but find that they now lose less than they did with no ventilation at all.

Another job involved plans for a plating room installation, with 68,000 cfm specified with a series of overhead hoods. Through the use of hoods at side and center of the tanks, the volume was reduced to 28,000 cfm. The company estimated that the saving in heating alone ran into thousands of dollars.

In going over the specifications for an exhaust system at a steel plant, the Division found that 16,000 cfm was needed to do an adequate job of exhausting the contaminants. The resistance of the system, however, was such that the specified fan would exhaust only 4000 cfm. Use of a different fan succeeded in exhausting the needed 16,000 cfm. If the company had installed the specified fan, it would have been worse than no exhaust system at all.

These various considerations, it is believed, point the way to effective and economic exhaust control.

Hot strength at falling temperatures

Does it influence hot tear formation?

D. C. WILLIAMS / *Assoc. Prof., Ind. Eng. Dept., Ohio State University*

Hot strength of sand as it cools from pouring temperatures and a procedure for obtaining additional, similar data are reported here. The author shows how strength development in the mold during increasing and decreasing temperatures could contribute to hot tears.

▪ For years many foundries have made serious attempts to accumulate extensive hot compressive strength data in order to predict the behavior of foundry sand mixtures when subjected suddenly to elevated temperature shock. Some dissatisfaction with the interpretation of data is evident to all who have been associated with work in this field. The purpose of this paper is to combine data obtained from the usual method with that obtained from an extension of the usual method to provide a possible explanation for a perplexing foundry problem—hot tears.

The data presented from the extension procedure is limited for it was obtained by the writer in spare time. (Carried out at Cornell University in 1944 when writer was A.F.S. Research Fellow.) The elevated temperature testing equipment used was the 1940 model dilatometer with the furnace which moved up and down. The test specimens were prepared in the usual manner and introduced into the preheated furnace and exposed for eight minutes. The power was then shut off and the furnace temperature was permitted to drop to specified levels and the test specimens were subjected to compressive loading.

The eight minute test specimen exposure time at a given temperature was, in 1944, considered satisfactory to bring the test specimen to adequate temperature levels throughout. Later studies [D. C. Williams and P. E. Kyle "Seventh Annual Report on Investigation of Steel Sands at Elevated Temperatures," *Transactions*, A.F.S. vol. 55, pp. 607-619 (1947)] revealed that the exposure time selected was not sufficient (Fig. 3). However, the writer feels that with longer exposure time, only the developed strength would change and that the general interpretation would be the same. Figures 1 and 2 were constructed using hot compressive strength data for increasing and decreasing temperature levels. The dotted line in Fig. 1 connects data points. However there remains the possibility that if data were available at intermediate temperature levels, the slopes of the curve for decreasing temperature levels would correspond to the slopes between 1850 and 2000 F for increasing temperature levels. The data for the increasing temperatures was taken from Fig. 18 of the Williams and Kyle report, and for decreasing temperature levels from Table 1. When the sand in a mold is heated it will return to room temperature if allowed sufficient time. Even in production foundries, it is probable that where shakeout follows shortly after pouring, sufficient time has elapsed so that the two parts of the curve may be of equal importance.

Heat-of-fusion range

From the relationship between developed strength and increasing temperature levels, it appears that small masses (possibly films) of the montmorillonitic clay-materials begin to fuse around 1600 F with the formation of glass and mullite. At 1850 F, all of the montmorillonite has been converted to glass and mullite. As the temperature increases above

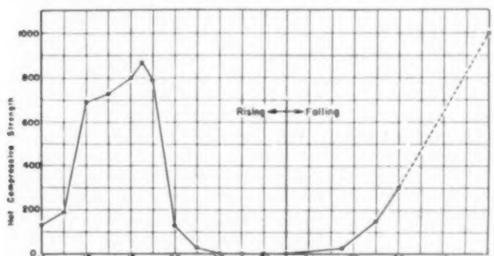


Figure-1 Hot compressive strength vs. rising and falling temperature levels with maximum temperature of 2500° F. Mixture, 5% Western Bentonite, 96% New Jersey No. 60 Sand and 5% Moisture

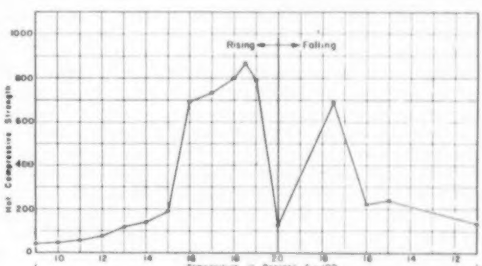


Figure-2 Hot compressive strength vs. rising and falling temperature levels with maximum temperature of 2000° F. Mixture, 5% Western Bentonite, 96% New Jersey No. 60 Sand and 5% Moisture.

1850 F, the glass becomes less viscous, resulting in lower strengths being developed in the test specimen.

The published data for the hot compressive strength of sand mixtures containing kaolinite type clay-mineral (found in naturally bonded sand mixtures and in fire clay bonding materials) indicate that the peak strength is attained at a temperature of 2050 F. It is also apparent from the data that fusion begins near 1950 F and is completed at 2050 F and as with the montmorillonites, the glass formed becomes less viscous with increasing temperature levels.

The glass content has so far been considered as that resulting from only the fusion of the clay-mineral. There is a probability of a fluxing reaction between that glass and the quartz of the sand grains producing an additional quantity of glass which would have a different composition.

Composition of glasses

The composition of the glasses formed by the fusion of western bentonite and by the fusion of southern bentonite, probably are different because it is well known that there is a marked difference in the hot compressive strength developed at 1850 F. This difference quite possibly is due to the available base-exchange ion present as well as the type of salts associated with the clay-mineral. (It should be understood that there is a difference between the available base-exchange ions and base exchange capacity.) Western bentonite carries the sodium ion for base exchange while southern bentonite has the calcium ion, and the glass formed undoubtedly has a composition and viscosity related to these ions.

The character of the glass formed by the fusion of kaolinite will be different from that of the montmorillonites because the quantity of exchangeable ions held by kaolinite is very much less. Also kaolinite is a clay-mineral in which atom substitutions or replacements is thought not to occur and therefore any glass formed should be more constant in composition. Further refinements in techniques and interpretation may provide more useful information involving the chemical analysis of clay-minerals and hot compressive strength.

From Table 1 it will be noted that test specimens, when cooled from 2500 F to 1600 F, developed a strength exceeding 1000 psi (the capacity of the testing equipment).

TABLE 1 . . . HOT COMPRESSIVE STRENGTH VALUES FOR DECREASING TEMPERATURE LEVELS

	Exposure Temp. 2500 F Testing Temperature				Exposure Temp. 2000 F Testing Temperature				Exposure Temp. 1600 F Testing Temperature			
Sand Mixture	2250	2100	2000	1600	1750	1600	1500	1100	1350	1200	1100	700
4% West. Bentonite	18	150	315	*	700	230	239	115	140	140	170	70
96% N.J. No. 60 Sand												
5% Moisture	45	150	297	*	675	210	230	147	160	195	238	65
4% West. Bentonite	33	142	280	*	860	850	440	100	70	150	80	16
1% Corn Flour												
95% N.J. No. 60 Sand	33	159	281	*	750	920	580	350	60	50	120	20
5% Moisture												
10% Portland Cement	47	103	223	*								
90% N.J. No. 60 Sand												
4.2% Moisture	47	93	193									
10% Portland Cement	47	70	180	*	0	4	4	4	0	0	0	
1% Corn Flour												
89% No. 60 N.J. Sand	47	70										
6.2% Moisture												
4% West. Bentonite	24	88	170	650	445	300	230	120	10	9	40	15
1% Corn Flour												
95% N.J. No. 60 Sand	36	98	120	650	460	270	230	75	5	0	10	4
3.6% Moisture												
4% South. Bentonite	6	30	67	250								
96% No. 60 N.J. Sand												
3.2% Moisture			70	330								
4% Fire Clay	60	225	380	180								
96% N.J. No. 60 Sand												
3.1% Moisture		245	385	175								
4% Fire Clay	120	407	627	212								
96% N.J. No. 60 Sand												
4.8% Moisture	112	387	592	207								
4% Fire Clay	57	192	202	87								
1% Corn Flour												
3.2% Moisture	57	172	177	87								

* Over 1000

It appears that there are at least two possible reasons for the increase in strength development during the decrease in temperature level. First the character of the glass formed by fusion of the clay-mineral at 1850 F is altered when subjected to temperature levels above 1850 F.

It seems more likely, however, that the glass formed at the 1850 F will react or flux with some quartz of the sand grains to produce more glass of a new composition when temperature levels above 1850 F are attained. It is well known that silica flour additions will increase the hot compressive strength of sand mixtures. It is difficult to understand how increased development of strength could be due alone to the discreet quartz particles.

The small size of the silica flour particles will be more readily reacted with the fused clay-mineral, producing larger quantities of glass for strength development during increasing and decreasing temperature levels. It would be interesting to know if a difference in developed strengths can be detected when cristobalite silica flour is submitted for quartz silica flour.

The fusion point of portland cement is approximately 2300 F and hot compressive tests on test specimens molded from mixtures containing this bonding agent, develop very little if any strength at temperature levels below 2000 F. This appears to indicate the lack of glass formation. However, if a temperature of 2500 F is attained, glass formation has occurred and the strengths developed during decreasing temperatures are comparable to those for the montmorillonites.

Factors affecting strength

The addition of a cereal, such as corn flour, does not appear to effect the development of hot compressive strength at temperatures where the more important glass bond is operative. The density of the sand mixture, reflected by moisture content, can be said to be related to the development of strength. Future studies probably will make more clear the effect of increased water additions above a certain minimum to provide adequate clay-mineral dispersion in sand mixtures.

The development of hot compressive strength is shown graphically in Fig. 1 when test specimens, molded from a sand mixture containing western bentonite, are heated to 2500 F and cooled from 2500 F. It is interesting to note that growth in the length of the test specimen occurred after heating and cooling.

Figure 5 indicates the increase in length after the test specimen has

been exposed to 2500 F for eight minutes and then cooled to 1600 F and subjected to a compressive load of 1000 psi. Two possibilities could account for this increase in length. First, there is the familiar permanent volume increase in an aggregated mass which develops after subjection to heat and illustrated by a baked core that cannot be fit into the core box. This growth is ascribed to a permanent enlargement of quartz sand grains. To date the writer has not learned of any evidence which supports the contention of quartz growth at core baking temperatures. The increase in the test specimen length shown in Fig. 5 could be attributed to a permanent enlargement of quartz sand grains. However, if a permanent set is said to occur at core baking temperatures why should there be further growth at a higher temperature level such as 2500 F.

Another reason for the volume increase of test specimens is concerned with temperatures above 1850 F. Above 1850 F, the glass becomes less viscous and due to the surface tension will tend to assume a spherical shape. In so doing, the locale of gathering could be where contact had been established between two grains. The accumulated glass separates the grains at point of contact thereby increasing the volume of the mass and at the same time the glass is sufficiently viscous to hold the shape of the mass. If the above is true, it follows that a longer exposure at 2000 F, for example, will produce as much glass as will be formed from shorter exposures at higher temperature levels. Further studies will be necessary to show the relationship between glass formation and growth in an aggregated mass.

Figure 2 graphically represents the strength developed by test specimen during increasing and decreasing temperature levels toward and away from 2000 F. Had the tests for developed strength during decreasing temperature levels been made after a soaking period longer than eight minutes, it is believed that higher test values would have been attained but the shape of a curve, plotting this data, would remain substantially as shown. It would not be surprising if a striking similarity was shown by curves representing data obtained from test specimens from other sand mixtures when the temperature levels were high enough to produce glass.

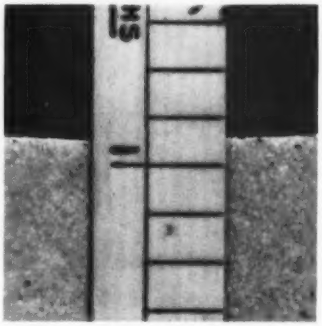


Fig. 5 . . . Before heat caused them to grow these two standard 2-in. sand test specimens were even with the 1-in. mark.

Since it is possible to obtain maximum hot compressive strength values with either increasing or decreasing temperature levels the following question can be raised. Is there one temperature level at which test values of significance can be obtained which will permit a prediction of performance of a sand mixture?

The relationship between hot tears and the data obtained can be considered using a U-shaped casting as represented in Figure 4. The solid contraction in the casting member X and Y is generally considered to occur unhindered in a direction toward the larger section. Such is the case except for the possibility of glass formation in the sand mixture surrounding these members. If glass formation promotes growth in an aggregated, mass there remains the possibility that a frictional force could develop between the growing sand mass and the relatively weak contracting member which would retard or prevent adequate solid contraction.

The solid contraction of the large horizontal member proceeds from the ends toward the center. Without any hindrance, X and Y will move closer together as required by the change in the large horizontal member. However a compacted sand mass is interposed between X and Y.

Assume that the maximum temperature level attained in layer A of Fig. 4 is 2000 F and the clay-mineral bond is western bentonite. Then refer to Fig. 2. The heat dissipated into layer A will fuse the clay-mineral forming glass which will become less viscous at 2000 F and develop less strength. As cooling in layer A begins, the glass becomes more viscous and more strength is developed in this layer. Simultaneously the sand mass of layer B is increasing in temperature level and if it attains 1850 F will develop the maximum strength. There is the possibility that the strength developed during the cooling of layer A will be equal to or greater than the strength developed in layer B on heating. The result is a large aggregated mass which has developed high hot compressive strength. This strength could greatly retard or eliminate the movement of casting members X and Y to accommodate the solid contraction of the large member. Separation or hot

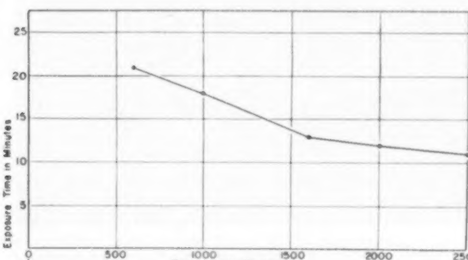


Figure-3 Exposure Time for center and surface of 1¼" X 2" test specimen to reach constant temperature after shock heating. After Williams and Kyle.

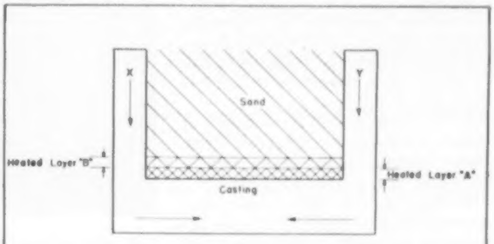


Figure-4 Schematic representation of the layers of sand mixture which are heated to sufficient temperature levels where high hot compressive strength is developed. Arrows indicate direction of solid contraction.

tearing will occur if various solid contractions are hindered.

It seems to follow that an adequate collapse of layers A and B is required in order to reduce the possibility of hot tears. This paper tries to relate the formation of glass (and the attendant development of strength) to the problem. Therefore it appears that collapsibility can be promoted by retarding glass formation. Increasing the rate of heat dissipation through the sand mass seems a promising procedure to bring about lower attained temperature levels in the sand mass. This can be obtained by using finer sands or by improved ramming methods to produce denser molds. Also an increase in water content of the sand mixture will yield denser molds and in addition aid in the abstraction of heat from the alloy and distribute the heat energy through larger volumes of the sand mass.

More research needed

A point sometimes neglected is that of sufficient coverage about critical parts of the casting. Whenever a part of the casting is covered by a thin layer of sand the rate of heat dissipation will be retarded and higher levels of temperature in the thin layer will be reached. The depth of sand covering required to maintain the most rapid rate of heat dissipation is not known with any degree of certainty.

No one knows better than the author, the meagerness of test data available for hot compressive strength at decreasing temperature levels. The author's data combined with an interpretation is presented with the hope that those interested in this subject may find a clue to a testing procedure which eventually may prove of value in eliminating some casting defects.

The following suggestions are presented for consideration by anyone intending to expand on the subject:

1. Before obtaining hot compressive strength data at decreasing temperature levels, the test specimen exposure times should be in accordance with Fig. 3.

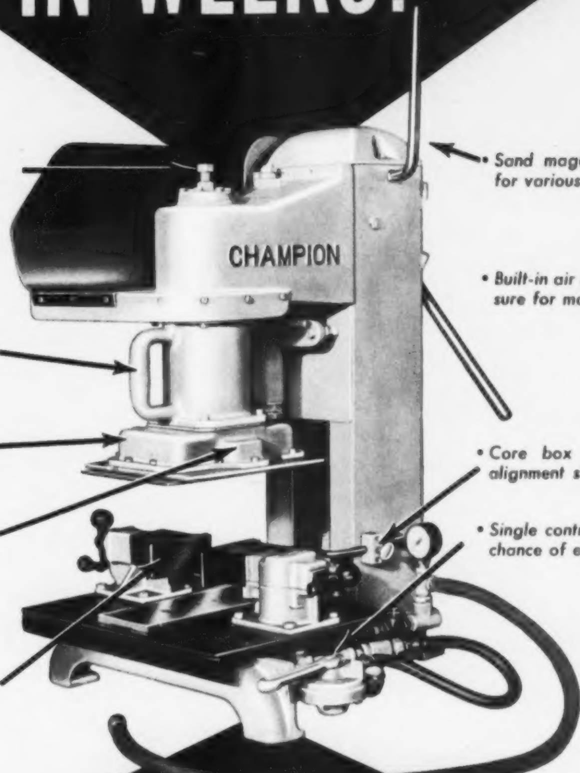
2. Test data should be obtained at closer temperature intervals than those reported above. Fifty degree intervals may prove satisfactory.

3. The 1940 and 1944 model dilatometers with a weighing system remodeled to loads greater than 1000 psi probably will be found more satisfactory in obtaining data at decreasing temperature levels.

▶ *Unusual melting furnaces, old and new*

Three-inch cupola being tapped by its builders, Fred C. Barbour (right) and William M. Spradlin, McWane Cast Iron Pipe Co., Birmingham, Ala., is improved model of original built in 1948 (see American Foundryman, May 1949, page 62). Original had no peep holes nor bottom doors, so two new miniatures were built for the 1952 International Foundry Congress. Normal charge is ½ lb iron, 1 oz coke, and ¼ oz limestone. Experiments in 3-inch cupola duplicate conditions in standard models. Blueprints can be obtained from Dr. Barbour, according to John F. Drenning, Kerchner, Marshall & Co., Birmingham District Chapter reporter.

J. G. Winget (left), Reda Pump Co., Bartlesville, Okla., and G. A. Conger, Cambria Foundry & Engineering Co., Ebensburg, Pa., study model of melting furnace designed in the 15th Century by Leonard da Vinci. Model was displayed at the 1952 International Foundry Congress by International Business Machines.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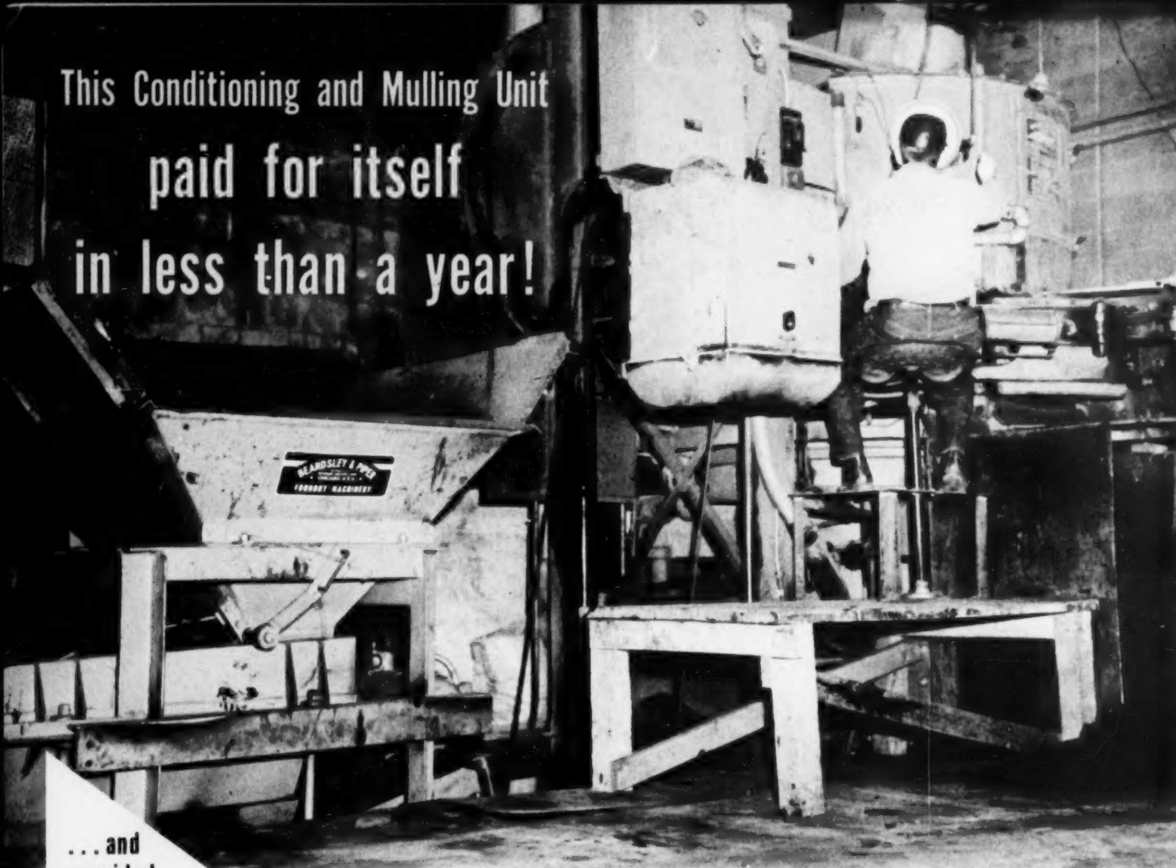

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Basic considerations in planning

Mechanization of a small foundry

W. A. MORLEY/*Superintendent, Olney Foundry, Link-Belt Co., Philadelphia*

There are many reasons for mechanizing a foundry—to increase production per man-hour and so lower unit costs, to conserve manpower and building areas, to improve working conditions, and to increase earnings by bettering quality. The decision to mechanize must rest upon a carefully considered plan. This article presents an outline of the information needed for such a plan.

■ The method of planning for mechanization of a foundry follows a general pattern, regardless of the size of operation contemplated. The suggested sequence for an organized approach to the planning for mechanization is: (1) determine the reason for mechanization; (2) review present facilities, personnel, and sales; (3) draw up and analyze a plan; (4) decide on the action, physical changes, and training required; and (5) follow up results.

The need to change the method of operation of a foundry probably is caused by one or more of the following requirements: (a) to increase productivity per man hour, and so lower unit costs; (b) to conserve manpower and building areas; (c) to improve working conditions; and (d) to improve quality and increase earnings for labor and capital.

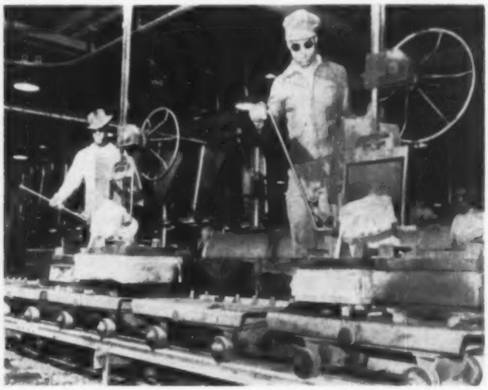
The people who are directly affected by a mechanization program in a foundry can be classed generally as customers, workers, management, owners, and suppliers. All of these groups contribute to and will participate in the benefits of a good mechanization program. The customer is interested in getting a product of adequate quality and appearance, delivered when he wants it, at a competitive cost. The worker requires wages that compare favorably with other workers in similar occupations and that his pay is relative to the effort and skill he puts forth. Continuity of employment is important to him as well as the conditions under which he works, and he takes pride in being a member of an organization with a good reputation. Management is concerned with the administration and cooperation of an organization that will produce a quality product at a profit. The owners are interested in the return on their capital investment on a long term basis. Foundry equipment suppliers are interested in satisfied users of their products and a continuing source of demand.

Resistance to change

All these folks must be sold on the idea that the plan presented is good for them. It must be kept in mind that people do not like to change their habits, so the manner of presentation and introduction of any plan must be carefully considered from the viewpoint of how it will be accepted.

It is well to know what the exist-

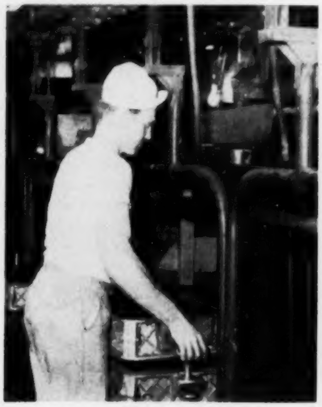
Before . . . Part of Oliver Corp. foundry at South Bend, Ind., showing hand pouring and typical non-mechanized operation in which molders set up floors to be poured off at end of day.



After . . . Mechanization of the Oliver foundry puts molds on track-type conveyors with automatic mold discharge, ladles on monorails, molding sand on overhead belt conveyors.

ing conditions are before making plans for changes. If a drawing of the plant is not available, have a simple one prepared locating the major work areas and equipment on the drawing. Capacities of equipment should be listed, such as molding equipment, cranes, compressors, etc.

A complete manning table should be made of the plant personnel, listing their occupations, and other experience that might prove valuable.



Molder closing flask prior to pouring on overhead trolley, pendant mold conveyor at Wagner Malleable, Decatur, Ill.

The probable attitude of the individual toward changes in his methods of operation must be included in this survey. If there is a union in the plant, its probable attitude toward a change in the method of operation should be ascertained. In the case of supervision, a more detailed listing of capabilities should be made. It is particularly important that the supervisory group be in sympathy with the need for and the practicability of the mechanization.

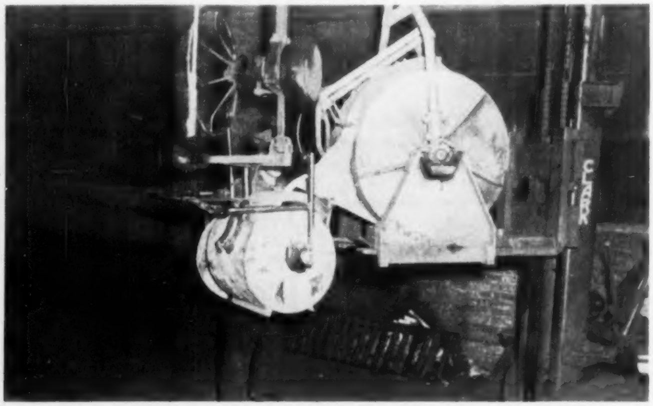
Sell the plan

An adverse opinion of the mechanization program on the part of individuals or the union need not deter planning. However, such an attitude should be recognized and steps taken to do a selling job to overcome their objections.

The output of the molders and core makers, under existing conditions, should be listed with a comment as to how this output compares with other foundries doing similar work under similar conditions.

The financial status of the foundry should be examined in order to determine whether funds are available or could be secured to pay for a mechanization plan. Common sources of funds are the sale of stocks, collateral loans from financial institutions, and previous earnings of the company. The funds available will determine the magnitude of the changes.

An examination of past sales and an analysis of potential sales must now be made because it is upon this



In Sibley Foundry & Machine Co., South Bend, Ind., metal is transferred from furnace to 500-lb pouring ladles by means of cylindrical ladle carried on fork truck. Several types of ladle-carrying trucks are in use in foundries.

information that the nature of the changes will be determined: the type of equipment needed and personnel requirements. Also, it will serve as a basis for figuring probable costs.

Current sales and sales records for past years should be broken down by years to show volume of shipments, number of pieces per order, average weight per piece, relative number of cores to molds, range of flask sizes (this can be reduced), and type of cleaning required.

Present customers should be interviewed as to their plans for future casting needs. If changes in their requirements from you are liable to occur, the information as to volume, type, etc. should be listed in the same manner as suggested for listing of current sales. This information will, of course, contain estimates.

Potential customers should be approached for similar information as to their possible future requirements, and the possibility of your participating in filling their needs. The possibilities so determined should also be assembled in the manner suggested. Some of this information will be of a general nature but should demonstrate whether the current type of operation should be continued or whether there is a greater potential in some change in the method of operation; for example, from strictly jobbing to semi-production, or from squeezer to squeezer and rollover molding.

After carefully weighing the probabilities as to casting demand on the foundry from current and potential customers, these requirements should be grouped together under the headings suggested so that the basic needs on which to plan for personnel and equipment are available. It is wise to have two sets of figures, one for maximum possibilities and one for minimum needs. In the use of these figures, some equipment will be planned for maximum needs, i.e. sand mullers and air compressors; other equipment will be planned for minimum needs.

Estimate probable sales

The information on probable sales will be used in planning in the following manner:

For the determination of molding methods, ascertain the range of casting size and weight, the average number of pieces per order in each size range, and the total volume in each size range.

The selection of the molding method, combined with an average output for this type of molding, will establish the approximate number of molds per hour. This output is limited by the number of cores per mold and by the pattern changes.

From these figures can be established: (1) the volume of sand needed per hour, (2) the mold storage areas, (3) flask and other auxiliary equipment needs and storage, (4) core volume, (5) number of molds, combined with average metal per mold. The latter will establish total metal needs, metal needs per hour, and whether continuous or batch of metal at given periods is needed, (6) tentative storage and handling methods for sand, cores, metal and castings, and (7) range of size, which will determine cleaning methods.

There are, besides, certain general principles that will govern our thinking of the mechanization of a small foundry:

General principles

1. The main function of mechanization is to augment and make more effective the activities of the personnel.

2. The greatest need in the foundry is for control of materials, processes, and personnel activities. Such control is limited by the ability to measure and control the variables. It is simplified by the use of mechanical equipment and the principles of motion economy.

3. In the smaller foundries, it is particularly essential that flexibility be maintained, that is, flexibility to take care of drastic changes in volume and considerable variation in type of work.

4. It is important that the over-all plan be established even though the initial moves will be limited. Proper sequence in these moves is necessary so that idle capacity does not develop, nor do we want overloading to develop in departments that have not been changed.

5. A survey of this nature should be made even though there are no immediate plans for changes. In fact, long established plans need to be re-evaluated every three to five years.

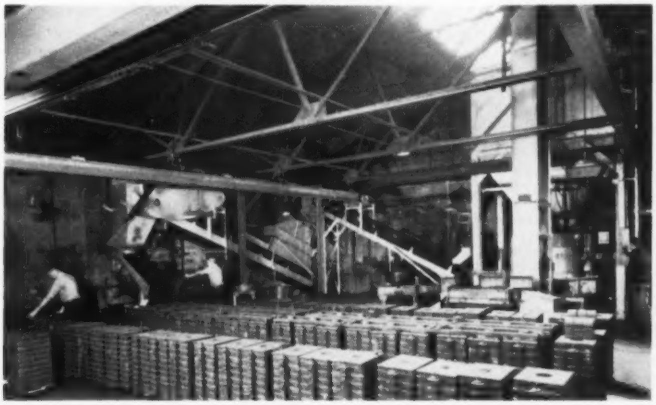
6. As soon as the general pattern of needs is developed, consultation should take place with reputable equipment manufacturers. Also, visits and talks with other foundrymen are important. Care must be used in evaluating the information secured from these sources to be sure that it is applicable to the particular situation. Details such as manpower to operate, maintenance costs, and output per hour must be noted and double checked.

With these thoughts in mind, let us now examine a suggested sequence of planning along with some of the details.

Planning sequences

A rough sketch should be made showing the relationship of the various departments, positioned for the best possible flow of materials. This plan should be drawn to include the available area but disregarding limitations of present location of departments or equipment. The flow plan then can be matched against the existing layout and compromises made. The compromises must be factual, not caused by purely mental reservations. The effect of initial compromise can be limited by the use of material-handling devices without great increases in the initial costs or operating costs.

The details of planning can be grouped for convenience of discussion under four heads: (1) Preparation layout. (2) Selection of equipment. (3) Organization and training. (4) Estimate costs. All these factors are interrelated and the investigation of them must proceed simultaneously.



Stack molding at Cutler-Hammer, Milwaukee. Molds move on dollies which roll on tracks. Sand goes from shakeout in right rear (for close-up see front cover) to bucket elevator via magnetic belt. Transfer belt (center) feeds conveyor (left).

Molds are dumped by hand from roll conveyor to an under-floor, oscillating conveyor at Crouse-Hinds Co., Toronto.

A scale drawing of the plant (minimum $\frac{1}{4}'' = 1'0''$) with the fixed items in place must be prepared. It is helpful to have a number of prints made as there will be a number of different arrangements proposed. Locate basic equipment, such as melting, sand preparation, and molding machines.

Provisions for these items are important: (1) temporary and permanent storage for auxiliary equipment, (2) temporary storage for work-in-process, (3) service aisles, (4) raw material storage, (5) personal facilities such as drinking fountains, showers, locker rooms, toilet facilities.

Of particular importance is the study of individual work areas. Good arrangement for shortest moves, minimum physical effort, and ease of cleaning are a few of the items to study. A great deal of time can be saved with a minimum of outlay when this particular phase of layout is effectively done.

Equipment of all types is used in foundries to reduce the time re-

TABLE 1: SAMPLE OF AN ANALYSIS OF THE EFFECT OF MECHANIZATION IN A GRAY IRON FOUNDRY PRODUCING 750 TONS OF CASTINGS PER MONTH

Name of Material and/or Operation	No. Tons Used Per Ton Castings Shipped	Tons Material Times Handled	Number Times Handled	No. Times Mechanical Methods Can Supplant Manual	Men Needed Using Manual Methods	Men Needed Using Mechanical Methods
		Melting Department				
Coke	.33	1.32	4	4	2	0.4
Pig Iron	.50	2.00	4	4	4	1.0
Foreign Scrap	.70	2.80	4	4	4	1.0
Home Scrap	.70	2.80	4	4	3	1.0
Other Materials	.05	0.20	4	0	1	0.6
Totals	2.28	9.12	4 avg.	3.2 avg.	14	4.0
		Incoming Materials				
Sand	.60	2.40	4	4	10	5
Bonding Material	.08	.32	4	2	2	1
Totals	.68	2.72	4 avg.	3.5 avg.	12	6
		Prepared Sand				
Shakeout Preparation Molding Mold Handling	15.0	105.0	7	7	120	90
		Molten Metal				
Pouring	1.6	3.2	2	Molds Brought to Pouring Station	10 (inc. part molders time)	4
		Core Room				
Preparation Delivery Sand Makes Cores Dry Cores Deliver Cores	.4	3.6	9	8	40	32
		Cleaning and Shipping				
Casting to Cleaning Chipping and Grinding Inspection	1.1	7.7	7	3	60	50
Totals	21.06	131.34			256	186
Supervision Service Maintenance	(Administration, Sales, Office, Timestudy, Production Control, Payroll, Janitors, etc. not inc.)				12 10 6	20 20 18
Grand Total	21.06	131.34			284	244
					x 40 less	

quired to accomplish given tasks. However, of equal importance in foundry operations is the element of control which is augmented by the use of equipment. The need for the control of variables is one of the major needs of the foundry. The equipment can be grouped in these general categories: service, auxiliary, processing, and material handling.

Service equipment includes: (1) Electrical supply, which should be of ample capacity. (2) Compressed air. Not only should the compressor be large but the distribution lines must be of good size, with moisture traps. (3) Lighting, which, because of the dark color of most sand, must be of rather high intensity. (4) Water, needed in many operations. (5) Heat, to assure comfortable working conditions and important to proper working of the equipment. (6) Ventilation adequate to improve working conditions.

Auxiliary equipment covers such items as flask equipment and bottom boards. There should be a critical examination of the sizes of flasks. Standardization of sizes to a limited number will provide savings in storage space, handling, and capital investment for flasks. Storage bins and racks are important as they assist in housekeeping and saving of space.

Processing equipment melts metal, prepares sand, compacts sand, removes patterns and core boxes from the sand, dries cores and molds, removes excess metal, heat treats castings, and helps to inspect them. There are many different types and kinds of machines for accomplishing this work. However, for small foundries, equipment should be flexible as to the size of units it can handle, and adaptable so that changes from one job to another can be made quickly. It must be rugged to stand the wear to which it is exposed. To pay for itself, equipment must be in operation most of the time. The manpower required to operate and service the equipment must be a lot less than would be needed with manual methods. It is important in the selection of equipment that it be observed in operation at other similar plants.

Potential savings

Material handling is particularly important in a foundry-mechanization program because it has been stated that there are from 150 to 200 tons of material handled for every ton of finished castings produced and certainly it is in this field that the greatest potential saving exists.

Material handling is also an adjunct to the control of variables that exist in the foundry. On the average, at least 30 per cent of the work force is directly engaged in the handling of materials and if we were to include the time the molders and core makers spend on material handling the percentage would increase to perhaps 45 per cent. The volume of material handled in various departments is some indication of the place where the greatest potential saving can be made. Most foundries will find that their experience will come close to that shown below.

PERCENTAGE	DEPARTMENT AND OPERATION
7.5	Melting and pouring
80.0	Molding, including sand preparation, distribution and return and casting shakeout
6.0	Core making and delivery
5.0	Cleaning, inspection and shipping
1.5	Heat treatment and recleaning

There is another consideration other than mere volume and that is that certain operations will lend themselves to mechanical handling devices, among them being metal charging, the handling of molten metal, distribution of sand and the handling and movement of molds.

In small operations, it is usually found that installation of equipment must take place in gradual steps. For instance, the cupola-charging installation can be made without affecting other departments to a great extent. Likewise, the preparation or distribution of sand can be accomplished without too much disruption of other operations. However, when installing such equipment, consideration must be given to the questions, whether preceding operations can supply the demand if the output is increased by mechanization, and on the other hand, will succeeding operations be able to take care of the increased load which can be developed by mechanizing certain operations. The matter of balance within the organization must be held within reasonable limits. Materials handling is particularly effective because it reduces the amount of time that skilled labor is employed in such operations as carrying out molds, shoveling sand, and hand pouring. It is important that these men expend all their time and energy doing the skilled operation of which they are capable (Table 1).

In addition to the direct economies possible, material-handling devices can provide additional benefits such as using otherwise idle space, such as by installing conveyors above the working height, etc. Material-handling devices tend to pace the operations and this pace can be varied in most cases. They remove many safety hazards, particularly those concerned with lifting, and they tend to improve the housekeeping of the foundry to a considerable degree.

The estimated costs for the complete plan will, no doubt, be greater than the funds available. Nevertheless, they must be listed in order that the most effective use of available money can be determined. It is also probable that there are many alternates and until the economies are fully established, it will be difficult to make a proper decision.

Included in equipment costs are: (1) delivered price of unit, (2) installation cost including service connections, (3) increase in cost of services, power, air, etc., (4) any cost due to interruption of production, (5) depreciation both on accounting and expected life basis, (6) effect on maintenance costs.

TABLE 2 ANNUAL AMOUNT THAT MAY BE SPENT FOR EACH $1.00 PER TON REDUCTION IN COST

Years to Amortize	Monthly Production in Tons 84	250	420	840
1	$ 833	$2,493	$ 4,165	$ 8,330
3	1,875	5,625	9,375	18,750
5	2,500	7,500	12,500	25,000

If building changes are needed, many of the above factors also will need to be reviewed as related to such changes.

It is necessary, in conjunction with cost of equipment installed, to carefully study the personnel required to operate and service each unit of equipment as this will have an important bearing on equipment selection.

Foundry labor costs will represent between 50 and 60 per cent of total costs so it is important that all probable labor costs be included in the comparison of the various plans. A manning table will assist in setting down this information in an organized fashion. Also it will help in arranging the proper lines of authority and responsibility. Careful consideration and measurement will be needed to draw the proper balance between an adequate work force and an uneconomic one. It is wise to use minimum figures for establishing a work force as it is difficult to reduce manpower after it once has been established. Many times, reallocation of duties and better scheduling of work can overcome seeming shortages of manpower.

In developing the manning tables, we can start with the direct labor group: molders, machine operators, core makers; then, the people who service the direct labor group: core carriers, cranemen and the like; then the auxiliary group. The cleaning department may be considered partially direct labor or as an auxiliary. The service groups then should be listed. Special attention must be given to maintenance, particularly if there has been no appreciable amount of equipment in the foundry previously. It must be realized that the operations are to a great degree going to be dependent on this equipment.

Essential details

Selection of equipment of adequate size and rugged construction is, of course, the first step. Regular lubrication is a must. Periodic inspection and correction of wear before it becomes dangerous must be the policy. Breakdowns of equipment will seriously affect output and

Sand preparation unit (left) and shakeout (center) at Dalton Foundries, Warsaw, Ind. Operator scoops sand and castings, dumps them in shakeout. Sand goes to left, castings to right.

Close-up of casting discharge side of shakeout at Dalton Foundries. Oscillation of conveyor moves castings toward dump box on monorail while operators sprue and sort them.

so must be guarded against. These actions should be recorded with the cost of doing them in order that proper steps can be taken to keep maintenance costs within bounds. Of course, the most important requirement is the proper personnel —people with good mechanical ability and the desire to keep machinery in first class condition, plus a foundry viewpoint.

Supervision important

The keystone of the whole plan is in the supervisory group. These men must look upon the plans with favor and be willing to put forth the effort to make them work. The more equipment that is added, the faster the pace will be and the greater the need for cooperation between departments. It is possible that the supervisory force will have to be increased. Supervisors should be brought in on the planning so that they can add their knowledge of men and procedures and thus feel they had a part in the changes. It will also give them an understanding of the over-all picture and the need for cooperative action.

The factor of control was mentioned. This applies not only to processes in the foundry, but to paper work as well. The accounting procedures must be examined to see whether they reflect costs accurately and in the proper manner upon which to base pricing procedures. Production control procedures must be such that castings are made and delivered when promised to the customer.

Time study necessary

As an aid to control, some type of measured time per operation is important. This may develop into a piecework system. Such systems, to be successful, must operate under proper conditions. Before rates are set, variables such as condition of sand, supply of materials, arrangement of work areas, must be removed or standardized. An equitable management policy as to piecework rates must be established. Rate cutting, rates based on guesses, variation in rates for similar jobs, and ceilings on earnings are sources of disagreement and eventual failure of systems. Properly established systems are a tool of good management and an aid to control. Even small foundries will derive benefits from having a good methods man.

If there has been much change in the mode of work to be performed by the individual worker, it will be necessary to arrange for training. This can be handled by the regular supervision or someone may be especially assigned to handle it.

There may be some need for changes in the method of handling patterns, particularly if there is some adjustment in the flask sizes due to standardization. Or there may be a change in the type of molding; for instance, from bench to squeezer, in which case there will be a need for mounting patterns on boards, placing gates and risers, and installing flask-pin guides on the squeezer boards.

The method of handling sales may be affected, due to some change in the method of shop operation. It is important that the sales force sell the proper type castings to fit the economic capabilities of the foundry. This will mean training of those handling sales.

These items, other than the direct manufacture, have been mentioned because they enter into the cost of making castings and should be included in the survey of manpower needs and other costs.

Analyzing costs

Operating costs will be influenced by the following considerations and should be expressed in some common denominator such as cost per ton or pound.

Labor costs come from the manning table. These should be enlarged to include those associated with wages, such as vacations, paid holidays, pensions, insurance plans, etc.

Operating supplies have not been discussed to any degree for they can be based on the present average usage per ton. There may have to be some adjustment due to changes in procedure, such as different type of sand, and the increase in usage of air, power, and the like service.

Fixed charges will be altered by increase in depreciation due to the increase in capital equipment. This will affect insurance costs and taxes to some degree.

Maintenance costs (as previously discussed) will be increased depending on the magnitude of changes.

Metal costs for raw materials will remain practically the same as the present experience per ton of castings.

There are probably several over-all plans, and in some cases, alternate equipment for doing the same operation. For this reason, the initial and operating costs for each phase of the operations should be assembled separately. This arrangement will be best for comparing the relative merits of the proposed plan with the existing methods of operation. After a selection has been made, the various phases can be assembled into the whole and a comparison made of the over-all plan.

Checking for accuracy

It would be advisable, at this time, to review the over-all plans with persons having experience in foundry mechanization. Perhaps the services of a foundry consultant are in order. Equipment suppliers can check on such things as capacities, probable output, general arrangement.

With proper application of mechanization, the possible savings will be attractive, and the other benefits will be an extra premium. Even though the over-all plan may be too elaborate for the particular installation, some phase of the plan will be helpful.

As a guide to the relation of the initial expenditure to the operating gains, Table 2 will be useful. The basis is savings per dollar ton vs. initial cost, and introduces the question of how quickly the initial cost must be amortized. These are rather general figures, so they must be interpreted broadly.

When the course of action has been determined, it is time to prepare the personnel for the proposed changes. You may be sure rumors have been circulated. They will cause some uncertainty. Put your program in its best light, and tell the work force the facts.

The making of physical changes, if at all extensive, should be entrusted to those experienced in such work. However, one of the supervisory foundry personnel must coordinate the installation with foundry operations. By so doing, foundry operations can proceed with surprisingly little interruption.

The facts upon which the decision to make changes was based must be used as a measuring stick during all phases of the changes and operations. Equipment cost, installation costs, etc. should be checked constantly. When operations begin, manpower, rate output, etc. must be compared. Deviations and their causes must be recorded and corrected. This practice will keep costs from getting out of hand and will improve the accuracy of future estimates.

Segregation during casting shown by radioactive antimony

Using the comparatively new technique of autoradiography, the authors show how the method quickly and easily demonstrated that gravity segregation in cast metals is minimized or eliminated by a fast cooling rate. They recommend the use of radioactive tracers for studying this and other foundry problems.

P. J. KILLABY, B. J. TAYLOR AND W. C. WINEGARD / *University of Toronto*

■ Lead-antimony alloys, noted for their high degree of segregation, were studied to see how to prevent segregation, and to establish whether it occurs during solidification or while the alloy is molten.

In the first experiment, lead-antimony alloy containing radioactive antimony was heated to 500 C and held at this temperature for 45 minutes. The melt was poured into three molds at room temperature. Each casting was sectioned longitudinally, polished, and autoradiographed. The autoradiographs were obtained by placing the castings, polished side down, on a photographic plate for 24 hours.

Prints of the three autoradiographs (Fig. 1) show that the castings were homogeneous and that each contains the same amount of antimony. They indicate that no segregation occurred while the metal remained in the crucible in a molten condition.

Geiger counter readings over the surface of 0.75 sq. in. of each casting gave 47,800 counts per minute, 47,500 counts per minute and 47,750 counts per minute. This further illustrates the marked absence of segregation.

Influence of cooling rate was studied in a second experiment by pouring at 500 C into molds at temperatures of 500 C, 250 C, and 20 C. Autoradiographs produced after sectioning and polishing which appear in Fig. 2 show that marked gravity segregation occurred when the alloy was cast into a mold at 500 C or at 250 C. When the mold was at room temperature the casting was homogeneous, indicating that the time take for solidification is the important factor in segregation due to gravity.

Antimony was added to molten pure lead in a third experiment. When the last of the antimony was seen to melt, a casting was poured. After 10 minutes, another casting was poured, and after another 10 minutes a third was cast.

Results from this experiment show that the antimony did not dissolve and immediately become evenly distributed throughout the melt. The first casting contained much more antimony than the remaining castings. After the first excess of antimony had been poured off, however, the remaining castings contained the same amount of antimony and no mechanical stirring was necessary to ensure good mixing.

The results show that gravity segregation does not occur in the liquid state and that it is easily controlled by rapid cooling. Though not new, they demonstrate that the radioactive tracer method is a useful tool for studying segregation. The authors believe that no other method can give results so quickly or completely and expect tracer techniques will find wider application in foundry work within the near future.

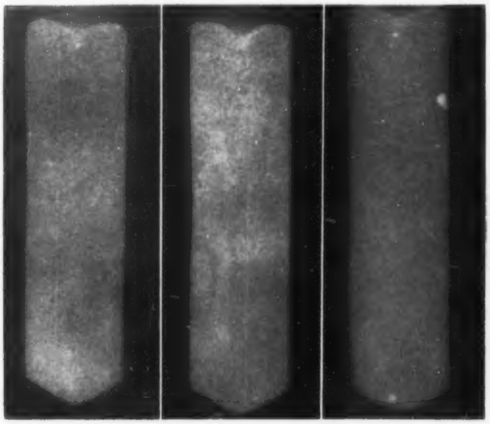


Fig. 1 . . . No segregation in the molten state is shown by these autoradiographs of lead-antimony test specimens.

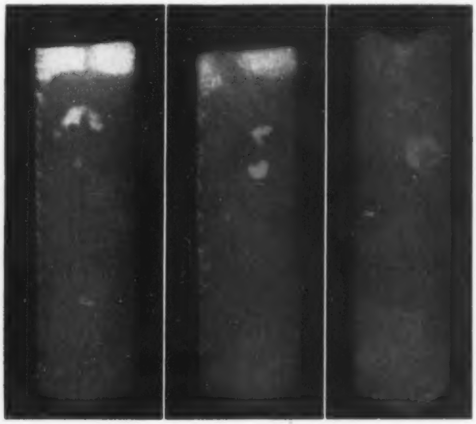


Fig. 2 . . . Segregation due to slow cooling rate. Castings were poured (left to right) into molds at 500 C, 250 C, and 20 C.

Judges' comments on entries in the 1952

Annual A.F.S. apprentice contest

ROY W. SCHROEDER/*Asst. Prof., University of Illinois, Chicago*

Good and bad points of some of the entries in this year's A.F.S. Apprentice Contest are reviewed here as a guide to apprentices entering the 1953 competition. The Apprentice Contest Committee, under the chairmanship of Prof. Schroeder, hopes these thoughts on some of the 1952 castings and patterns will help the industry's budding craftsmen do a better job in their shops as well as in competition.

■ Each year Apprentice Contest judges find good and bad examples of molding and patternmaking among the many entries in the industry-wide competition. Analysis of the entries from year to year indicates that many of the same mistakes are made repeatedly, although there is no geographic pattern nor indication that up to a certain point in training mistakes are made, while beyond this point they do not occur.

In general, the best entries were characterized by good workmanship carried out in a reasonable time. Winning castings had good yield,

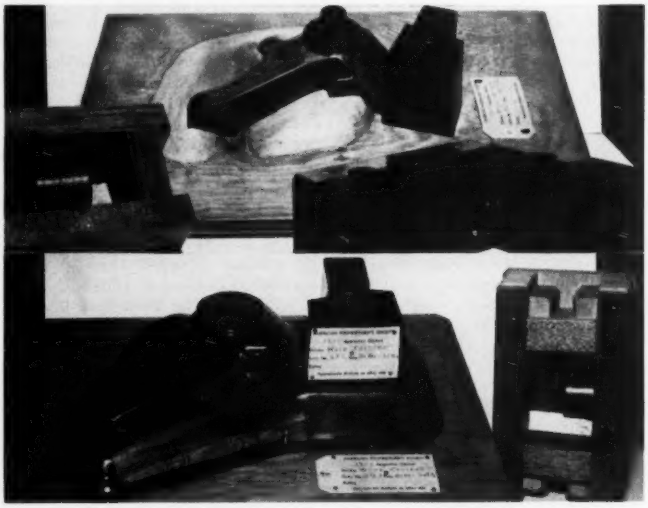


Fig. 2 . . . First prize (upper) and third prize (lower) patterns illustrate good craftsmanship, high degree of moldability, and were constructed in a reasonable time.

Fig. 1 . . . Not a prize winner, this casting has low yield, high cleaning cost.

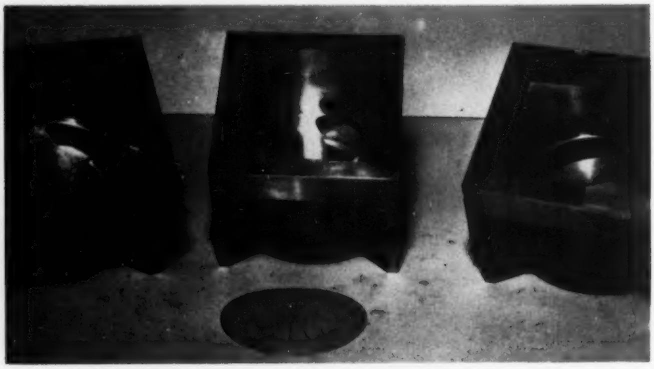


Fig. 3 . . . Three best metal patterns and the template used to aid in checking core prints in the bottom of the box. Accuracy was checked to third decimal place.

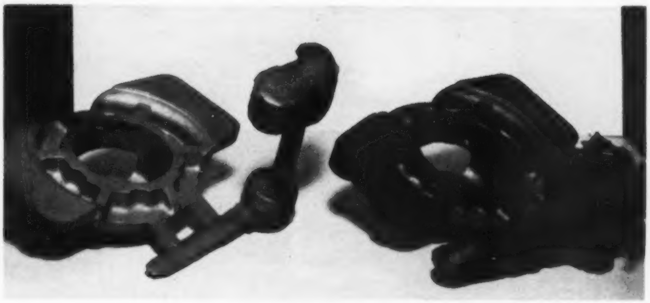


Fig. 4 . . . First (left) and second place winners in gray iron. Judges felt runner in cope could be deeper; in-gates could be made to break off closer to casting.

Fig. 7 . . . Casting at left is costly to clean; right, soundness is questioned.

Fig. 5 . . . Upper left and right are first and second prize non-ferrous castings. Lower right is third place winner who would have rated higher but had a crush.

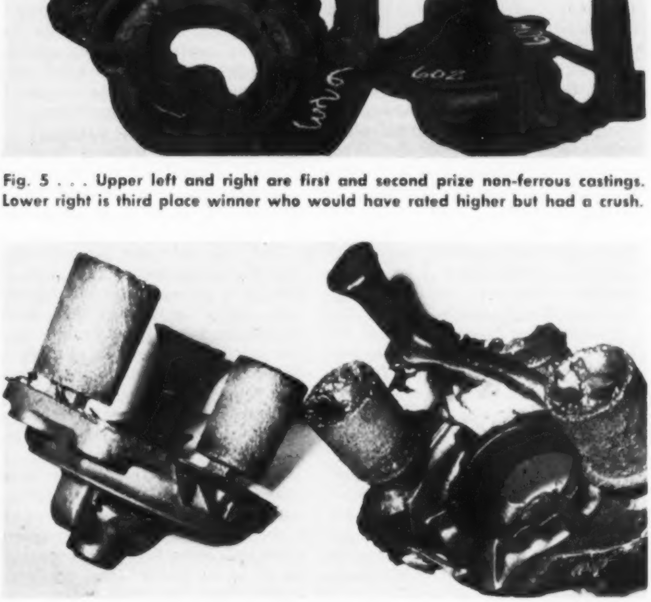


Fig. 6 . . . First prize (left) and second prize steel castings were made by apprentices who believe a fin is better than a crush. Knock-off risers simplify cleaning.

were sound, would be easy to clean, and had good salability. In the wood pattern competition, moldability and simplicity were outstanding in the top entries. Superior accuracy and finish were found in the best of the metal patterns.

Poor yield and unsoundness, as illustrated in the steel castings of Fig. 1 and 7 were duplicated in inferior entries in the other molding divisions—gray iron and non-ferrous. The first prize steel casting (Fig. 6) weighed only 23 lb with gates and risers while those shown in Fig. 1 and 7 range between 34 and 40 lb. Compare the ease of cleaning the first prize winner with knock-off risers to the high cost of finishing a casting in which risers completely cover the section fed.

The second place steel casting (Fig. 6) was marked down because of its heavy risers and long runner. Cope and drag sections of the runner did not match and could readily have contributed to a shrinkage problem.

The first place gray iron casting shown in Fig. 4 showed the judges that the apprentice used good facing to get superior surface finish, rammed carefully to eliminate swells, and parted his mold well to avoid both fins and crushes. They felt the workmanship would please any supervisor, that any foundry would be proud to put its stamp on the casting, and that any purchaser would pay a premium for the high quality. The judges' only criticism was to make the runner in the cope deeper and to construct the in-gate with more of a choke as well as pinching it a bit at the sides and close to the casting so it would break off close to the casting.

Surface quality of the second prize gray iron casting was slightly below that of the first place winner,

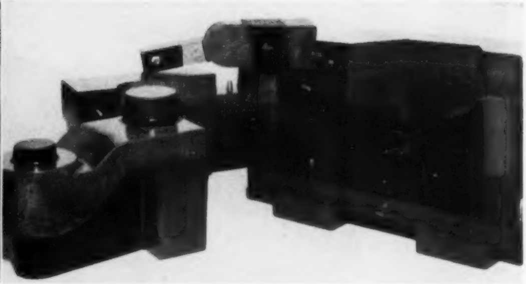


Fig. 8 . . . Otherwise good, these patterns are typical of many on which apprentices did not position lug correctly.

Fig. 9 . . . Best pattern for workmanship, this entry lost points because complex core would require bedding and wires.

Fig. 10 . . . Patterns require narrow, deep pocket in cope. "Kiss-through" core needed (left) would be difficult to set.

Fig. 11 . . . Only one pattern entry used a green sand core in the hub. Dowel (right) and loose piece are weak points.

gating was almost identical (including the mistake noted above), but gates and runners were larger than the judges believed necessary.

In the non-ferrous molding division, the first and second prize winners illustrated in the upper part of Fig. 5 had smooth surfaces and were free of fins, crushes, or dirt inclusions. Yield was good and radiographs confirmed the soundness of the castings illustrating the effective use of two different gate locations. The whistler on the boss contributed to soundness.

Use blind riser

The non-ferrous third place winner (Fig. 5, lower right) would have rated higher if a crush had not been evident on the inside of the ring. This entry illustrates effective use of blind risers.

The large number of pattern entries complicates judging in the wood pattern division, but the variety of ways in which a pattern can be made is a constant source of amazement and amusement to the judges. The relatively new contest division for metal patternmakers provides less opportunity to exercise ingenuity but puts a premium on craftsmanship and accuracy. In the metal pattern division, accuracy is checked by specialists from plants noted for their precise metal patterns. Each point on the drawing was checked to the third decimal place and judges found that the three prize winners shown in Fig. 3 were amazingly similar in accuracy as well as in finish.

In the wood pattern competition, moldability and simplicity were outstanding in the top entries. These qualities, along with excellent craftsmanship, are illustrated in Fig. 2.

Though the blueprint called for only 25 castings, many of the patterns were equipped with followboards, some of which were far more elaborate than warranted. Follow blocks used in some cases (Fig. 10) were too deep for good moldability. In addition, some patternmaker apprentices planned on a "kiss-through" core which in this job would be difficult to set without shaving the mold or creating a fin if the core were filled to eliminate shaving.

The most common and least excusable error in this year's wood pattern entries was the incorrect positioning of a small lug. Neither of the patterns in Fig. 8 has the lug correctly located and many apprentices who did otherwise good work were marked down for failure to hold this important dimension.

▶ ***Job training for veterans***

Apprenticeship training is available to veterans of the armed forces who have served creditably for not less than 90 days on or after June 27, 1950.

The bill provides a maximum monthly subsistence allowance of \$70 for a veteran with no dependents; \$85 if he has one dependent; and as much as \$105 if he has more than one. The allowance is made in addition to the regular apprenticeship wage paid by the employer. The combined earnings and allowance, however, will not exceed \$310 per month.

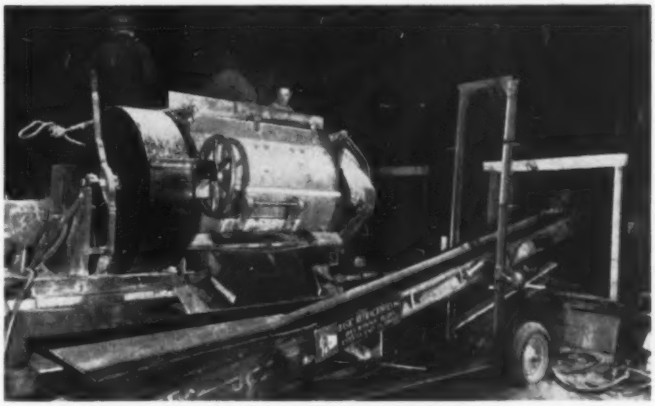
To be eligible, the veteran must submit to the State approving agency and to the Veterans Administration a copy of his apprenticeship agreement indicating the work for which he is being trained and his wage scale. Also, the agreement must certify that upon completion of training the veteran will be offered employment as a journeyman.

Going to try a basic lining?

Here's a guide for refractory selection

J. P. HOLT / *Sales Engineer, Basic Refractories, Inc., Gary, Ind.*

Modern thermo-metallurgical processes are constantly creating new problems for the maker and user of refractories. No single refractory, nor even an elaborate combination of them, can solve all these problems. Here, however, is a comprehensive discussion of basic refractories which should serve as a helpful guide toward higher production and greater economy in refractory practice.



Mixing magnesia ramming with water during installation of a furnace hearth. Blade type mixer discharges into belt which takes mix directly into furnace.

■ Increasing demand for high quality iron and steel castings—coupled with the scarcity of good raw materials for electric furnaces, open hearths and cupolas—has caused more and more foundries to turn to basic steel-and-iron making processes. Object of this change is to eliminate certain elements contained in the available scrap, pig iron and coke.

Refining action of these basic processes requires contact of lime-rich slags with the metal being produced. In addition, some such processes require much higher temperatures than does the usual acid operation. Construction of furnaces, cupolas and crucibles to meet these requirements has brought into being a group of refractories called "basic."

Most of these basic refractories used commercially contain as their principle components one or more of three substances—crystalline magnesia, crystalline lime and the spinel mineral chromite. These substances are oxides with high melting points and are highly resistant to the fluxing actions of hot, basic slags. In contrast, the most common acid refractories, containing silica or silica and alumina as their major constituents, are rapidly attacked by hot, basic slags.

Probably magnesia (MgO) with a melting point of 5070 F[1] is the most important component of basic refractories. It exists in refractory products either as periclase (crystalline MgO) or in association and combination with other oxides, notably the oxides of calcium, iron, silicon, chromium and aluminum.

When magnesia is heated to high temperatures, it is converted largely into crystalline periclase.[3] These crystals are stable and have excellent refractory properties. Thermal conductivity of magnesia is about twice that of fireclay. Compared with fireclay brick, however, brick made substantially of magnesia have low resistance to thermal spalling.

Absorbs iron oxide

Magnesia, however, can absorb large quantities of iron oxide before its softening temperature is reduced appreciably. Addition of other lower melting oxides does not appreciably impair its refractoriness and it will bond readily at reasonably elevated temperatures. Properly bonded magnesia has excellent physical strength and load carrying abilities at very high temperatures. Pure magnesia, electrically fused, is costly to produce; consequently, its use is limited.

Lime (CaO), usually thought of as a slag-making material, is nevertheless a very refractory oxide (melting point, 4630 F) and serves as an important bond for many other refractory oxides, most commonly in combination with magnesia.

A 50-50 molecular mixture of lime and magnesia contains about 58 per cent lime and 42 per cent magnesia. This mixture has a melting range of about 4170 F to 4350 F. Widely available in a raw state, this class of materials (known as dolomite refractories) has many important uses.

Dolomite refractories have a relatively high thermal conductivity compared with fireclay. The addition of small amounts of certain other oxides will bond dolomite grains at reasonable temperatures. When

properly bonded, such structures offer good resistance to many basic slags even when more than normal amounts of silica are present.

Spinel chromite minerals which occur in chrome ores vary considerably in composition and contain not only the spinels but accessory minerals as well. A spinel is a crystalline compound of the general formula $RO \cdot R_2O_3$ and the spinel minerals consist essentially of solid solutions of FeO, MgO, Cr_2O_3, Al_2O_3, and Fe_2O_3. The melting point of most refractory chrome ores is above 3600 F.[2]

It is difficult to form ceramic bonds in most chromite refractories, but a structure of this material has excellent resistance to certain basic slags which contain large amounts of iron oxide. Such structures have a thermal conductivity about 1.5 times that of fireclay.

About granular refractories

Production of granular refractory material is usually essential to the processing of the raw materials into finished refractory products. Some granular refractories are used for fettling furnace hearths. The common granular refractories used in basic operations are dead burned magnesite, dead burned dolomite, crushed or ground refractory chrome ore, forsterite and olivine.

The term magnesite[7] is used to designate both the mined mineral ($MgCO_3$) and the product of magnesite kilns, dead-burned grain magnesite. Various grades of this kiln product contain from about 65 per cent to more than 90 per cent MgO. The main sources are mined magnesite, brucite ($Mg(OH)_2$), magnesium hydroxide recovered from sea water or brines, and dolomite rock ($CaCO_3 \cdot MgCO_3$).

In Nevada, the state of Washington, and Quebec, there are deposits of magnesite rock used for refractory purposes. Nevada and Quebec also have deposits of brucite. Dolomite is widely distributed and usually is found in extensive deposits.

The feeds for magnesite kilns are either essentially $MgCO_3$ or $Mg(OH)_2$ or both. Consequently, when dolomite is the raw material, it must be treated in sea water or other brines to separate the magnesia from the lime. Plants in New Jersey, Michigan, Ohio and California produce magnesium hydroxide in this way for further processing in kilns.

In general, there are two ways of producing dead-burned grain magnesite from the raw magnesium hydroxide or carbonate. The first consists of crushing the mined rock to predetermined size, putting it through a rotary kiln whose hot end is kept at temperatures in excess of 3000 F, cooling the resulting nodules and screening them in preparation for shipment or further processing.

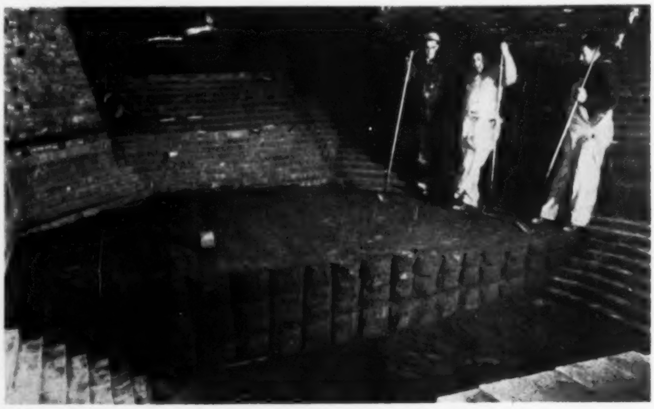
Another method is to grind the feed to a fine, wet powder. The resulting slurry is then fed into a high temperature rotary kiln. The products of this operation are lumps and balls of dead-burned magnesite which are then crushed and screened for proper sizing. The advantage of producing large lumps which require subsequent crushing is that the end product consists of angular grains which compact more easily into dense refractory materials or will maintain a much steeper angle of repose on a furnace bank.

Good for monolithic lining

The product of the magnesite kiln should be dense and hard and, compared to dead-burned dolomite refractories, highly resistant to hydration. It should be readily adaptable to forming monolithic structures.

Normally there are three principle grades of dead-burned magnesite. They contain different amounts of MgO. The grain which contains 90 per cent or more MgO is used mostly in brickmaking. The regular grain magnesite containing 82 to 87 per cent MgO while used partly for brick, is also used for ramming mixes and for fettling. The third grade is the so-called quick-setting magnesite. It contains about 65 to 72 per cent MgO. This substance is the base material for certain ramming and hot patching mixes and is useful for fettling without further processing.

Regular dead-burned grain magnesite is used principally to rebuild, resurface or repair basic hearths. It requires the addition of as much as 20 per cent open-hearth slag so that the grains will fuse together at normal, open-hearth operating temperatures. Regular grain magnesite frequently finds use in open-hearth shops where the production of low carbon steels requires the use of highly oxidizing slags.



Installing a rammed magnesia hearth. Edge of finished section was roughened to achieve adhesion to next section after wooden form was removed.

Quick-setting grain magnesites do not need the addition of as much slag to produce sintering. These magnesites already have sufficient sintering agents in them and often are preferable to the regular grain magnesite for fettling because the patch obtained is more nearly uniform chemically than the usual careless mixture of conventional magnesite and slag.

The slag found around most shops contains unwanted materials, such as nodules of iron and steel or pieces of fireclay and silica brick which are damaging to the resulting structure in the furnace. Resurfacing basic hearths or forming the working surfaces of emplaced rammed bottoms are typical uses of quick-setting magnesite.

Like magnesite, the term "dolomite" is used loosely to designate both the mined mineral ($CaCO_3 \cdot MgCO_3$) and the product of the dolomite kilns, dead-burned dolomite. The latter is known also as black dolo-

mite and double burned dolomite, although it is neither completely black nor burned twice.

Quarrying, crushing, sizing and washing are the first steps in processing dolomite. Then, with a small amount of added iron oxide, the prepared rock travels through large rotary kilns whose hot ends are at temperatures of about 3000 F.

On its way through, the granular rock liberates its combined carbon-dioxide gas forming weak, porous

Refractory deposits in hot end of magnesite kiln are shot away with 3-oz lead slugs.

grains known as calcined dolomite. (Can also be produced in cupolas.) When it reaches the hot end, it shrinks to produce dense, hard grains. After cooling, it frequently will receive a thin coat of oil to reduce its tendency to hydrate when stored for extended periods of time.[1]

Dead-burned dolomite is one of the most important granular refractories because of its large use as such without further processing or addition of sintering or bonding agents. Nearly every steelmaking plant uses large quantities of this material to repair basic bottoms of open hearth and electric furnaces. The basic steel industry in this country consumed 1,750,000 tons in 1951.

In addition to its use as a fettling material, dead-burned dolomite is the major constituent of some ramming mixes and gun refractories. In Europe[8] there are monolithic open-hearth bottoms and linings for electric furnaces, basic Bessemer converters and cupolas made from hard burned dolomite with tar as a binder. Rammed dolomite linings have given excellent service in small, single-phase arc furnaces[8] which, except for the method of heating, are similar in construction and size to high-frequency induction furnaces.

Most dead-burned dolomite contains about 36 to 38 per cent MgO, 52 to 54 per cent CaO, 6 to 8 per cent iron oxide, 1 per cent silica and minor amounts of other oxides.[1] Small amounts of liquids start to form in dead-burned dolomite at about 2500 F. These liquids enable the grains to sinter together to form a hard, dense structure.

Such a structure exhibits excellent over-all resistance to slags from basic cupolas, open hearth or electric furnaces. These slags are particularly hard on most basic refractories because they often change in character from more or less acid or neutral to highly basic.[1]

Changes in hearths

Actually, since nearly all basic furnace practices include the use of lime-rich slags, even hearths that were originally of high magnesia content show unmistakable trends toward the dolomite composition soon after they are put in service. After a few weeks, this chemical change may penetrate the hearth substantially. After a year or two of operation, some hearths attain a dolomite-like composition all the way to the bottom of the monolithic structure.[4]

In one form or another, dolomite is satisfactory for a wide range of basic refractory uses. It is readily obtainable, comparatively inexpensive, widely used for heat to heat maintenance, and is a reliable standby refractory for emergency use.

No substantial deposits of refractory chrome ore have been developed in this country. We import the material from Cuba, the Philippines, Rhodesia, Turkey, the Transvaal and Greece. The average composition of a satisfactory grade of chrome ore is 4 to 9 per cent SiO_2, 10 to 14 per cent FeO, 10 to 30 per cent Al_2O_3, 32 to 42 per cent Cr_2O_3, 15 to 20 per cent MgO, less than 2 per cent CaO, less than one per cent MnO, and a loss on ignition of 1 to 3 per cent.[2] However, there are many other chrome ores whose compositions do not fall exactly in these limits and most refractory manufacturers prefer chrome ores that are low in silica and lime.

In some electric furnace processes where it is desirable to obtain chromium in the metal through direct reduction of the ore, powdered chrome ore finds use as a fettling material. However, extracting the chromium in this manner destroys the ore and though it may act temporarily as a heat resister, it is not a true refractory.

A few electric furnaces producing low-carbon stainless steels use chrome ore extensively as a true refractory, Because the chrome ore is so resistant to very hot slags that contain large quantities of iron oxide, moderate success is obtained even though it is difficult to make any newly emplaced material stick to the hearth.

Ground chrome ore is the major constituent of some refractories made for pneumatic gum emplacement. It is used to some extent to repair open-hearth flush and tap holes, gas ports, skewbacks, door linings and hot flues (or for mortars for the same purpose). It is the major constituent of chrome brick. Another important use of chrome is in combination with magnesia to form the excellent chrome-magnesia and magnesia-chrome refractories.

Forsterite is a mineral containing the theoretical composition of 57.3 per cent magnesia and 42.7 per cent silica corresponding to the chemical formula $2MgO{\cdot}SiO_2$. Its melting point is 3461 F. Olivine is a series of mixed crystals of forsterite and fayalite ($2FeO{\cdot}SiO_2$). The rock consisting of olivine and minor amounts of accessory minerals is known as dunite. Certain grades of dunite are the raw materials for olivine and forsterite refractories.[3]

Perhaps in certain senses of the word, olivine should be called a basic refractory for foundry purposes. It has limited use as a molding sand, but is not strongly basic.

Applications of forsterite

Heating the proper grade of dunite or olivine with sufficient amounts of magnesia produces forsterite refractories. Forsterite refractory products have excellent physical strength and stability, and they perform well under certain high-temperature conditions where strongly basic slags are not apt to come in contact with them. Forsterite refractories have lower thermal conductivities than similar refractory products made from the other basic materials discussed here.

Many of the granular materials discussed above are compressed and bonded into standard brick forms and special shapes. There are numerous types of basic brick but

when compared to good fireclay brick most commercial basic brick have the following characteristics in common:[3] (1) they are more resistant to lime-rich basic slags; (2) they are more resistant to iron oxide at high temperatures; (3) in general, they are attacked more rapidly by silica-rich acid slags; (4) most basic brick have higher thermal conductivity under normal furnace conditions; (5) they are more subject to thermal spalling; (6) they have greater thermal expansion; and (7) basic brick are considerably denser (heavier per brick of the same size.)

Installing the lining

These characteristics should be borne in mind when erecting a basic brick structure and the following suggestions may be helpful.

1. Allowance for thermal expansion should be made by leaving adequate expansion joints or voids in the brickwork.

2. Vertical, straight walls like the end walls in open-hearth furnaces should be supported by inserting steel plates between every three or four courses and welding these plates to the furnace buckstays or other ironwork.

3. Many types of basic brick may be purchased encased in steel plate. This type of brick may be used in vertical curved walls like those in electric arc furnaces without additional support, and to augment that support in the vertical, sraight walls mentioned above.

4. Basic brick in full roofs or sections of roofs should be separated by steel plates and individually supported by hooks and rods attached to the steel furnace framework above the roof.

5. Basic brick may be used without steel support in cupola linings for the following reasons:

(a) cupolas are generally smaller in diameter than most electric arc furnaces and this small arch holds the brick in place; (b) basic linings in cupolas often are not so high as those in electric furnaces, and (c) it is common practice to install a monolithic layer of basic refractory on the inner lining face which helps to protect the brick.

6. Often it is necessary to install some insulation on the outside of a basic brick furnace or cupola lining to preserve thermal conditions within that existed when the structure was built of fireclay brick.

7. Because heat is transferred more rapidly through long distances in basic brick structures than it is in comparable fireclay brick structures, it is often necessary to provide longer and more intense heating-up periods. This is particularly noticeable in basic cupolas and special care should be given to heating basic slag-hole and tap-hole blocks to prevent slag and metal from freezing in them.

8. Patching (other than rebricking) should be done only with a basic plastic mix or mortar. Fireclay or "ganister mixes" should never be used because they may flux away the basic brickwork even at relatively low temperatures.

Basic brick may be either chemically bonded or fired. The chemically bonded brick are made from sized granular refractories to which have been added small amounts of bonding agents that enable the brick to harden without subsequent heating to high temperatures. Fired brick are made from the proper granular refractories and bonded by heating at temperatures that are high enough to enable partial melting and development of ceramic bonds. Fired brick may or may not have small amounts of additional bonding agents added to the granular refractory used. Both types of brick are formed under very high pressure to insure maximum density in the finished product.

General suggestions

It is impossible to make accurate general statements comparing the properties of all the chemically bonded basic brick with those of all the fired basic brick. However, the following may be regarded as a general guide when a certain type of basic brick has been prescribed and there is a choice to be made between chemically bonded or fired brick. These statements refer to good quality basic brick of the same type and for the same application, keeping in mind, of course, that not all types of basic brick are available as both chemically bonded and fired: (1) chemically bonded brick generally have better resistance to thermal spalling; (2) many chemically bonded brick can be made to close dimensionál tolerances. However, commercial grades of fired brick are excellent in this respect; (3) most fired brick have better volume stability at high temperatures; (4) generally, the porosity of the fired brick in service is slightly lower; (5) thermal conductivity of the fired brick is often slightly higher.

In general, the chemical compositions of fired and chemically bonded brick of the same type are slightly different, making accurate comparison between two similar types more difficult. Certain differences in raw materials and methods of manufacture might invalidate any or all of the above statements. However, if we can consider these statements to be generally true, it becomes apparent that the chemically bonded brick should be used in roofs, upper linings and for slag and tap-hole blocks where extra resistance to thermal spalling is important, and the fired brick in hearths, subhearths and cupola wells.

There are five well-known varieties of basic brick—magnesite, forsterite, magnesite-chrome, chrome-magnesite and chromite. In discussing individual properties of these brick, it is well to remember that some of these properties should be modified as above according to whether the brick are chemically bonded or fired.

Magnesite brick

Magnesite brick may be either fired or chemically bonded. They are strong, hard and dense, and maintain their strength at high temperatures. The shrinkage occurring when better grades of burned magnesite brick are heated to high temperatures is very low. They have excellent resistance to most basic slags —even those which contain more than normal amounts of iron oxide like the finishing slags on low-carbon, open-hearth steel heats. They are not so resistant to basic slags which contain more than normal amounts of silica as are some other basic refractories.

In rating the various basic brick with respect to their ability to resist spalling in rapid temperature changes, the burned brick are considered "fair" and the chemically bonded, "good". Magnesite brick contain 80 to 90 per cent (or more) of MgO, the chemically bonded brick being generally a little lower in MgO than the fired brick. Both types are used extensively in open hearths, electric furnaces and nonferrous reverberatory furnaces.

The raw materials for megnesite-chrome brick are magnesite and chrome ore with magnesite predominating. Chemical compositions range from approximately 60 to 85 per cent MgO and 3 to 10 per cent Cr_2O_3. They may be either chemically bonded or fired. Chemically bonded and

burned brick are rated "excellent" as to their resistance to thermal spalling. Like magnesite brick, they are hard and strong at elevated temperatures.

Magnesite-chrome brick are relatively inactive toward most basic slags, performing much like magnesite brick in this respect. They have particularly strong resistance to abrasion and their largest use is in rotary cement, lime and dolomite kilns and in upper structures of top charged melting furnaces. It is possible under certain conditions to pick up small amounts of unwanted chromium in molten high carbon steel or iron which come in contact with these brick.

Chrome-magnesite brick are made of chrome ore and magnesite with chrome ore predominating. Combinations range from 30 to 40 per cent MgO and from 20 to 30 per cent Cr_2O_3. These brick, too, may be either burned or chemically bonded. Some grades of these brick maintain their refractoriness at considerably higher temperatures than do comparable magnesite brick.[9] Most basic slags, including those which may be high in silica or iron oxide, do not attack them rapidly. Thermal-spalling resistance of chrome-magnesite brick is rated "excellent" for the chemically bonded brick and "good" for the fired brick. From the consumption standpoint, the most important use of these brick is in open hearth and electric furnace construction and for the sidewalls of copper and brass reverbatory furnaces. Under certain conditions, molten high carbon steel or iron probably will pick up some chromium from these brick if the molten metal comes in contact with them.

Chromite brick

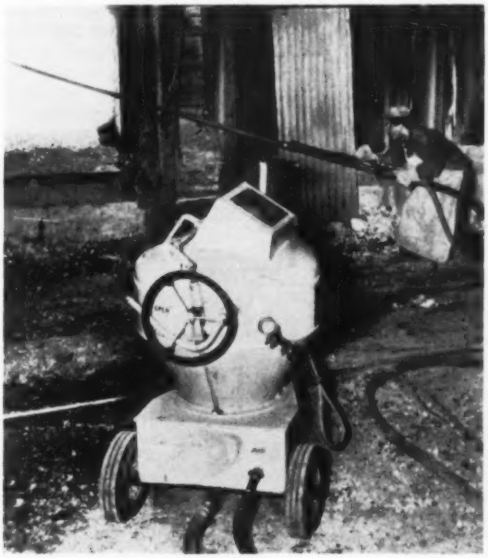
Although there are chemically-bonded chromite brick in existence, fired chromite brick are more commonly available. They are made from certain chrome ores and most fired brick contain from 18 to 20 per cent MgO and 30 to 40 per cent Cr_2O_3. Their resistance to thermal spalling is rated as "fair to poor" in relation to other basic brick. They have excellent resistance to certain quite hot steelmaking slags which are very high in iron oxide and they have fair resistance to certain mildly acid slags as well. They evidence very little permanent shrinkage when heated.

Molten iron and high carbon steels attack chromite brick readily as do reducing slags. Even low carbon steels melted against chromite brick will often pick up appreciable amounts of chromium from the brick. However, they are satisfactory for use in electric furnace hearths where low carbon stainless steel is made at high temperatures and oxygen is used to decarburize the bath.[6] They are used in many electric furnace and open hearth sub-hearths and their outstanding resistance to attack by iron oxide makes them an excellent refractory for the hearths of soaking pits, forging furnaces and welding furnaces.

Granular basic refractories have been used since the early days of steelmaking. In recent years refractory manufacturers have sized these bulk materials, blended some of them and added small amounts of bonding chemicals to produce ramming mixes, gun refractories, plastics and mortars.

Classically, dead-burned grain magnesite and slag thrown into the furnace and burned in place with a hot flame or electric arc was the method of installing basic furnace hearths. Since magnesite is difficult to sinter, it was a time-consuming job. Today virtually all new furnace-bottom installations are rammed in place using a magnesia ramming mix at room temperatures. Many of these same ramming mixes may be used to make rapid hearth repairs which formerly required the tedious burning in of a granular bulk refractory.

Some of these mixes will set up at room temperature after water has



Using pneumatic refractory gun, worker shoots patch into place on the back skewback of a large open hearth furnace.

Rotary magnesite kiln at Nevada plant produces dead-burned magnesite for brick, for ramming mixtures, and for patching.

been added. Others require moderate heating to bond them. Although gun refractories are somewhat different from those prepared expressly for cold ramming, many users employ the two interchangeably. Prepared mortars generally consist of finely ground particles which are shipped dry, like the ramming and gun mixes, with the necessary wetting agents and bonds already admixed. Plastics are generally purchased in the form of stiff mud which may be used as is or softened by adding water.

Air-setting mixtures

The high magnesia ramming mixes contain from 65 to 95 per cent MgO. Their lime content will vary from under 2 up to 20 per cent. They also contain small percentages of bonding chemicals. The air-setting, high-magnesia, ramming mixes usually contain sodium silicate which combines with water to enable the material to set up at low temperatures.

The temperature-setting mixes do not contain any substance which will enable them to harden simply by mixing them with water. However, they are particularly useful for hot patching where the temperatures encountered are high enough to enable the ceramic bonds in the refractory to take effect. Some of these mixes sinter and even vitrify at moderate temperatures; consequently, they are strong below the surface of the monolith where the high temperatures in the working surface of the hearth cannot penetrate.

None of these ramming mixes will melt at temperatures of 3600 F and higher so their magnesia content (when considered for its temperature resistance alone) is often not the critical property. It is far more important to insure a strong structure throughout the entire monolith than to attempt to obtain resistance to surface temperatures which are much higher than those which could possibly occur in the furnace.

In most ramming mixes, strong and stable ceramic bonds start contributing strength to the refractory at about 2500 F. The higher-magnesia ramming mixes are very resistant to iron oxide but are attacked by some basic slags which contain more than normal amounts of silica. Mixtures lower in MgO are not quite as resistant to certain basic slags which are unusually high in iron oxide. But they are much more stable toward basic slags high in silica.

Most of these mixes resist hydration well during shut-down periods, but direct contact with water or dampness may cause them to disintegrate slowly. By design, these refractories are cold ramming or hot-patching materials but a refractory gun can emplace them to effect hot repairs of walls, door jambs and skewbacks, enabling such repairs to be made without shutting down.

Some refractory manufacturers make dolomite mixes expressly for use through a refractory gun. The base material is dead burned dolomite with added magnesite. A typical refractory of this type contains about 50 per cent magnesia and 35 per cent lime. These refractories may be either air-setting or temperature-setting. They are widely used as a patch material for basic sidewalls in cupolas, electric and open hearth furnaces, reverberatory and heating furnaces and, to a lesser extent, for cold-ramming and hot-patching furnace bottoms and tap holes.

Ramming mixes and gun refractories of a chrome-magnesite composition comparable to the corresponding brick have proved to be extremely useful for many applications, particularly where adherence of the refractory to a vertical basic brick or acid brick wall is required. These materials have some excellent refractory properties that compare favorably with those of chrome-magnesite brick. Patching the skewbacks in open-hearth tap holes are typical applications. More recently, they have been used successfully as a lining for electric furnace hearths where oxygen is used in making low-carbon, stainless steel. Resultant high temperatures, turbulence and iron oxide in this operation have proved very damaging to most other refractories.

Straight chrome-ore gun refractories are available. They are of a typical chrome ore composition and have silicate or organic bonding materials added to them. They are useful for covering either acid or basic

continued on page 102

now, there's an idea!

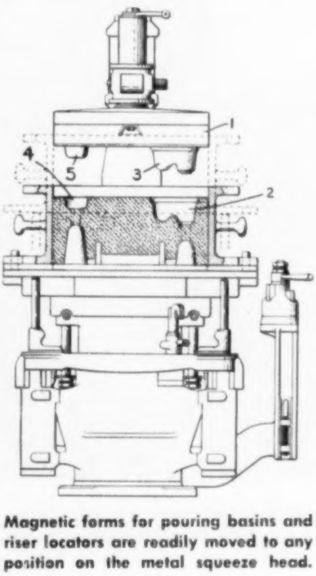
Practical ideas, developed and proved in foundries and pattern shops, are presented in this column. *Now, there's an idea!* helps American Foundryman readers promote the exchange of ideas, the motivating force behind the American Foundrymen's Society. Contributions for publication are solicited. They may be of any length, preferably short, preferably illustrated by photo or sketch.

■ Plastic patterns containing permanent magnets have speeded up changes in position of pouring basin and riser locator patterns at Worthington Corp., Harrison, N. J., so much that mold production has increased 100 to 125 molds per week during the past year. The idea was developed by Eugene Sudziarski of Worthington and patents have been applied for.

Use of magnets to hold the forms to the metal squeeze head, rather than bolts or studs, makes rapid changes possible along with a high degree of flexibility as to location. Another advantage is the increased life of the squeeze board. Before the magnetic forms were used, squeeze boards were replaced every few weeks; now they last well over a year.

The illustration shows typical use of the magnetic forms. Numbered parts are: 1, metal squeeze plate; 2, pouring basin; 3, pouring basin pattern; 4, riser locator; and 5, riser locator pattern.

The forms are easily moved by the molder but remain securely in place during molding Mr. Sudziarski said in reporting his development at a Shop Kinks session of the Metropolitan Chapter of A.F.S.



Magnetic forms for pouring basins and riser locators are readily moved to any position on the metal squeeze head.

Founders meet in Northwest and New England

Annual regional conferences

Held simultaneously at opposite ends of the United States, the Northwest Regional Foundry Conference and the New England Regional are reported here by, respectively, Norman E. Hall, Electric Steel Foundry Co., Portland, Ore., and Walter M. Saunders, Jr., consultant, Providence, R. I. Photos of the Northwest Regional are by Mr. Hall.

At pre-conference dinner honoring Vice-President Collins L. Carter, Albion Malleable Iron Co., Albion, Mich. Left to right are: Conference Chairman W. R. Pindell, Northwest Foundry & Furnace Works, Inc., Portland, Ore.; Mr. Carter; and Oregon Chapter Chairman Wm. Halverson, Electric Steel Foundry Co., Portland.

■ The Northwest Regional Conference was held October 24 and 25 in the Multnomah Hotel, Portland, Ore., with some 235 foundrymen and their ladies from the Pacific Northwest and British Columbia in attendance. An innovation at this year's conference was the display of the latest types of non-destructive testing equipment.

The opening technical session, "*Non-Destructive Testing*," was called to order the evening of the 24th by Harry Czyzewski, Metallurgical Engineers, Portland, who introduced the speaker, Prof. S. H. Graf of Oregon State College. Prof. Graf gave a brief history of non-destructive testing, and outlined the problem of producer-purchaser disagreements over specifications, referring to the work in this field of Committee E-7 of the American Society for Testing Materials, and of the Society for Non-Destructive Testing.

A round table discussion followed this talk during which the following panel members joined Prof. Graf in answering questions: Paul Fischer, Hyster Co., Portland, representing purchaser of castings; Wm. Sullivan, Electric Steel Foundry Co., Portland, representing ferrous foundries; Gunnar Lund, Pacific Chain & Mfg. Co., Portland, representing non-ferrous foundries; Richard Turner Magnaflux Corp., representing distributors of testing equipment; and session Chairman, Czyzewski, representing commercial laboratories.

The first session the following day was opened when A. A. Belusko, Electric Steel Foundry introduced Charles B. Schureman, Baroid Sales Div., National Lead Co., Chicago. He spoke on "*How About Becoming Sand Conscious*." Mr. Schureman told of the many variables, which may exist in the preparation of sand mixes which cause them to be non-uniform in mechanical properties from batch to batch with resultant rough or defective castings.

Preparing sand mixes

Foundry management and supervision should see that proper mixing and measuring equipment are used in the preparation of sand mixes, the speaker said. He added that efficient sand mill operators should be employed to operate mixing equipment which should be kept in a first class repair. Mr. Schureman stated that mixing should be done carefully, the materials should be added in correct order and the sand mix should be mulled uniformly for the proper length of time.

Following the question and answer session for Mr. Schureman's address, the film "*Sand*" produced by Whitehead Brothers, New York, was shown. The film showed processing of sand from deposits in the eastern part of the United States before use in industry.

The noon luncheon, planned entirely by the student chapter at Oregon State College, featured an address of welcome on behalf of the City of Portland by Mayor Dorothy McCullough Lee. She expressed her desire that the delegates enjoy their stay in Portland and hoped for continuance of foundry conferences which, she said, promote progress in the industry.

Professor James W. Smith of Oregon State College, Corvallis, luncheon chairman, introduced Dean George W. Gleeson, of the OSC School of Engineering who spoke on "*Conservation of Energy*." He recommended starting as soon as possible a planned program for the conservation and use of our natural resources.

The speaker pointed out that we have in our efforts to protect, consumed that which we have set out to protect. We have been using more of our natural resources in wars than we have been able to protect in them. We now have a choice of patterns for conservation, but if we do not put some plan into effect

within the next decade, he warned, we may not have a choice in the matter.

Edward D. Boyle, Puget Sound Naval Shipyard, Bremerton, Wash., introduced by C. N. Wilcox of Electric Steel Foundry Co., presented a paper on "*Use of Mineral Perlite in the Foundry.*" Mr. Boyle briefly reviewed the quarrying and preparation of perlite for foundry use and explained in detail the use of the materials as an admixture for both core and molding sands, and also as an insulator for risers and ladles.

Mr. Boyle compared his work with perlite with his earlier experiments using diatomaceous earth. Both are excellent for cushioning sand against mold expansion types of defects and as insulators in prepared pads and riser collars. On non-ferrous castings the diatomaceous earth appeared to be a better insulator, he said. Powdered perlite used as an insulator on the top of risers makes them more efficient and makes reduction in riser size possible, he declared.

The final technical session was devoted to a talk entitled "*Olivine in the Northwest Foundry*" by Prof. W. A. Snyder, University of Washington, Seattle. Session chairman was Fred Young, E. A. Wilcox Co., Seattle. Prof. Snyder told of the deposits of olivine in the State of Washington, but added that none is available commercially as yet. The present method of crushing the material is in a jaw-crushing mill and then it has to be screened for proper grain size. This method has a tendency to produce some dust and also breaks up the natural grains.

Prof. Snyder described the use (since October 1950) of olivine in the university foundry where it has replaced silica sand in all applications except cupola patching. Properly graded, he said, olivine makes an excellent foundry sand. Advantages, he declared, include high fusion point, low thermal expansion, high heat absorbing capacity, and high density.

While much work has been done with olivine sands ranging in permeability from 10 to 550 and clay from 1 to 4 per cent, no research has been conducted on cores, Snyder said. However, he summarized observations made in production and use of olivine cores. The high heat absorbing capacity of olivine, which is beneficial in producing smooth castings, is slightly detrimental in that it increases baking time and burn out rate, according to the speaker.

While the technical sessions and noon luncheon were in progress, the ladies attending the conference were entertained at a special ladies brunch for which Hugh Templeton of Balfour-Guthrie Company, Ltd., assisted by Mrs. Al Holmes, was chairman. Following brunch the women were taken on a shopping tour.

The success of the conference banquet, Saturday evening was largely due to the excellent planing of James Brodigan, Columbia Steel Castings Co., Portland, and his committee. He was unfortunately taken ill the day before and was unable to attend the conference. Conference Chairman Pindell acted as toastmaster for Mr. Brodigan.

Vice-President Collins L. Carter, Albion Malleable Iron Co., Albion,

Edward D. Boyle, Puget Sound Naval Shipyard, Bremerton, Wash., discussed the use of perlite in molding sand.

Charles B. Schureman, Baroid Sales Div., National Lead Co., Chicago, discussed modern core and molding sands at the Saturday morning technical session. Session chairman was A. A. Belusko, Electric Steel Foundry Co., Portland.

Prof. S. H. Graf, Oregon State College, was principal speaker on non-destructive testing at opening session.

Prof. W. A. Snyder, University of Washington, describing uses of olivine as molding and coremaking material.

Mich., provided an interesting account of the functions of the Society and its officers and directors, and mentioned the new publications of the Society, as well as the latest reports on the research program carried on by A.F.S.

In enumerating the research projects carried out in the various fields of foundry practice as represented by the A.F.S. technical divisions, Mr. Carter stated that the results of the research were available to all. He cited the extensive use and popularity of the three films on fluid flow and said that several copies of the films had been sold in Europe.

Mr. Carter reminded his listeners of the responsibilities of the chapters in representing the technical interests of the industry in their respective communities. Both a local and a national responsibility, he said, is the Safety & Hygiene & Air Pollution Program which the Society is carrying on in behalf of the foundry industry. All foundrymen can participate in this activity, he pointed out, in outlining the 10-yr program calling for contributions from the industry of $35,000 a year.

Richard L. Neuberger spoke on the history of Oregon Legislature. Oregon was the first to adopt the initiative and referendum measure adopting it in 1902 according to the speaker. Following the banquet the balance of the evening was devoted to dancing.

With a total registration of 235, the technical sessions showed attendances of well over a hundred. Sixty three women attended the ladies brunch. Conference committees and officers were: General chairman, W. R. Pindell, Northwest Foundry & Furnace Works, Inc., Portland; vice-chairman, Wm. Halverson, Electric Steel Foundry Co., Portland; Reception, Registration & Housing—George C. Vann, Northwest Foundry & Furnace, chairman, assisted by Fred Young, E. A. Wilcox Co., Seattle, and Carl Irwin, Ingersoll-Rand Co., Seattle; Technical Sessions James T. Dorigan, Electric Steel Foundry, chairman, assisted by C. N. Wilcox and A. A. Belusko of Electric Steel Foundry, and Fred Young; Finance—M. O. Woodall, Rich Mfg. Co., Portland; Banquet—James Brodigan, Columbia Steel Casting Co., Portland, chairman, assisted by K. K. Manchester, Oregon Steel Foundry, Portland; Publicity—Norman E. Hall, chairman, and Dar Johnson, Jr., both of Electric Steel Foundry; Luncheon—Prof. James W. Smith, Oregon State College; and Ladies Brunch—Hugh Templeton, Balfour-Guthrie Co., Ltd., assisted by Mrs. Al Holmes.

New England regional

The 12th New England Regional Foundry Conference, held at Massachusetts Institute of Technology October 24 and 25, attracted a record turnout of 425 foundrymen. As in past conferences, sponsorship was by many foundry and metal society groups headed by the New England Foundrymen's Association in cooperation with MIT and the A.F.S. Student Chapter at MIT.

Robert C. Walker, Whitin Machine Works, Whitinsville, Mass., was the conference chairman, with Frank R. Elliot, Westinghouse Electric Corp., as vice-chairman, Henry Frechett, Fitchburg Foundry, Fitchburg, Mass., as program chairman, and Arthur J. Tweedie, William Duncan Co., as non-ferrous chairman. Registration and Reception Committee was again headed by C. A. Wyatt, Debevoise-Anderson Co., Boston, as chairman, and Herbert H. Klein, Klein-Farris Co., Boston, as treasurer.

Prof. Howard F. Taylor, welcomed the conference to MIT at the start of the program on Friday morning, and spoke briefly on the work of his foundry students. Following the opening, simultaneous sessions were held, one on ductile iron, the other on non-ferrous shell molding. C. K. Donoho, American Cast Iron Pipe Co., Birmingham, Ala., gave a most interesting talk on "*Melting Ductile Iron in a Basic Cupola.*" As a pioneer in both basic linings, and ductile iron, Mr. Donoho was in a position to describe both operations minutely, and all important points were well covered.

During the question period, considerable discussion evolved around the possible variation in ferrosilicon from different sources as regards the deoxidizing effects obtained. Clyde Armstrong, Warren Pipe Co., Everett, Mass., was chairman of this session, with Ahti Erkkinen, Builders Iron Foundry, Providence, R. I., as co-chairman.

During this period the non-ferrous group heard Bernard N. Ames, New York Naval Ship Yard, Brooklyn, speak on "*Shell Molding as Applied to the Non-Ferrous Industry.*" He described the process in detail, and emphasized the problem of overcoming finning, and the steps that could be taken to eliminate this trouble. He also called attention to the savings in machining costs on a few castings he had worked on. Frank Volp, Sommerville Machine & Foundry Co., served as chairman, with Oscar Swangren, Dorchester Brass & Aluminum Co., as co-chairman.

Mayor Dorothy McCullough Lee, Portland, who gave address of welcome to Northwest Regional Foundry Conference attendants, was introduced by Prof. James W. Smith, Oregon State College. OSC Student Chapter planned meeting.

After lunch, both groups combined to hear William Rose, Borden Company, New York speak on "*Shell Molding.*" This talk supplemented that given by Mr. Ames for the non-ferrous group, and gave the iron foundrymen a chance to learn the details of making shells for many metals. It was brought out in the discussion period that shell molding will not replace all sand castings, but that there are many applications where it will be valuable. The chairman, and co-chairman, were Earl W. Jahn, Production Pattern & Foundry Co., Hopedale, Mass., and William F. Francis, Draper Corp., respectively.

At the final session on Friday

afternoon, Alexander Magoun, consultant on labor relations, presented an entertaining, and provocative talk on *"These Mortals."* Prof. Magoun spent considerable time distinguishing between rules and principles. Industrial engineers concentrate on rules, he said, and a good executive should be concerned primarily with getting these rules understood. An executive's task is to understand "these mortals," because all behavior is logical if it is understood, the speaker declared.

Building morale

Men are more important than machines, and self respect in any individual must be established, according to Prof. Magoun. Do not dominate and do not hesitate to inquire into the personal life of an employee, because many difficulties are due to problems in personal life, he advised. A. J. Cassista, Rollsonee Foundry, was chairman of this session, and Alexander Beck, Whitman Foundry assisted as co-chairman.

On Friday evening, the annual conference dinner was held in the new quarters of the Faculty Club at MIT. Prof. Taylor was the chairman at this dinner, and Thomas I. Curtin, Jr., Waltham Foundry, Waltham, Mass., was co-chairman. Ollie Rodman, editor of *Hunting and Fishing*, and provided through the courtesy of Mystic Iron Works and the New England Coke Co., was the main speaker. He showed films on bass and striper fishing which were highly entertaining to even a foundryman who still thinks of fishing in terms of a bent pin and a branch from a tree.

On Saturday morning, Harry W. Dietert, H. W. Dietert Co., Detroit, spoke on *"Foundry Core Practice."* He covered properties of cores such as density, green compression and green hardness, overhanging, cracking, sagging, and stickiness. Also discussed were ramming, air set properties, atmosphere control of core ovens, correct amount of water, hardness testing, venting, and collapsibility. Chairman Leroy M. Sherwin, Brown & Sharpe Mfg. Co., Providence, R. I., and Co-Chairman Carl Erickson, Franklin Foundry, Hyde Park, Mass., had difficulty in closing the question period in time for the next two conference sessions which were held simultaneously.

The simultaneous sessions covered *"Cupola Operation"* and *"Effect of Gating Design on Casting Quality."* The cupola session was conducted by a panel consisting of Stanley H. Bullard, Bullard Co., Bridgeport, Conn., William Olson, Draper Corp., Augustus Bondry, Whitman Foundry, and Walter M. Saunders, Jr. Mr. Saunders started the discussion by telling how he would run a 42-in. cupola to produce five to ten tons of 30,000 psi cast iron at 2800 F. Chipping, patching, lighting, making the bed, iron charges, coke splits, amount of air and other details were covered briefly.

Under the expert chairmanship of Joseph B. Stazinski, General Electric Co., West Lynn, Mass., and Mr. Bullard, doubling as co-chairman, the next hour saw the blackboard covered with figures. Bed heights varied between 48 inches and 72 inches above the tuyeres, and coke ratios from 4:1 to 7:1. No foundryman would admit getting less than 2800 F iron at all times, and all seemed to be melting at extremely fast rates.

New A.F.S. film shown

At the non-ferrous session, the A.F.S. film on gating was shown. Under the chairmanship of Ely Portman, Stillman White Foundry Co., Providence, R. I., and with Robert Sheldon, Springfield Bronze and Aluminum Co., as co-chairman a lively discussion ensued, and many valuable experiences exchanged.

The latest A.F.S. film on gating (the third) carries on from where the last film ended. The previous film showed how to employ restrictions in the runners at each side of the sprue base to minimize dross inclusions. However, the system operated favorably only with certain runners and gates.

The newest film summarizes the trials made with varying combinations of sprues and runner designs in which special attention was paid to the shape of the system at the base of the sprue. Three basic designs were employed: (1) the inverted T; (2) the enlargement, in which the runner was enlarged laterally but not in depth at the sprue base; and (3) the well, in which the enlargement was increased in depth.

The inverted T, though commonly used, aspirates air severely, as shown by the film, and its use is not recommended. The enlargement proved to be an effective design for reducing turbulence under the sprue and for preventing aspiration of air or mold gases. Its effectiveness, was shown to be restricted to narrow, deep runners or square runners.

Summarizing the results of many tests the film showed that a well below the sprue would keep castings clean. Area of the well recommended is five times the area of the sprue base, while depth below the runner should be equal to the depth of the runner.

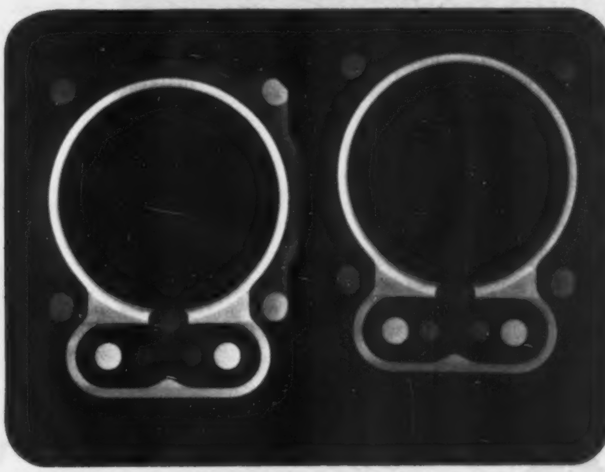
On Saturday afternoon only one session was scheduled. Clyde A. Sanders, American Colloid Co., Chicago, presented a talk entitled *"How Can Best Castings Results be Obtained with Naturally Bonded Sands."* He stated that more natural than synthetic sands are used today, in spite of the feeling a few years ago by some people that synthetic sands would replace all natural ones. For proper use of synthetic sands, he declared, a foundry must have equipment, control, and supervision. The main disadvantage of synthetic sands lies in their drying out, and the difficulty of patching, said Mr. Sanders. Both of these can be overcome, he pointed out, but there is less trouble when natural sands are utilized.

He explained the 1-to-10 ram test, referring to his article on the subject which had just appeared in the October issue of AMERICAN FOUNDRYMAN. Albert Nutter, E. L. LeBaron Foundry Co., Brockton, Mass., as chairman, introduced Mr. Sanders, and John V. Dahlberg, Kidder Press, as co-chairman, led the discussion period.

Following their usual practice, the local representatives of the foundry supply companies, under the chairmanship of Ray Hunter, Hunter Sales & Engineering Co., with Harry Impey, Tabor Mfg. Co., as treasurer, staged a smoker for the foundrymen at the Parker House on Saturday evening.

▶ *Foundry accidents decreasing*

Injury-frequency rates in steel, gray-iron, and nonferrous foundries for the first six months of this year are well below the average for a corresponding period in 1951, according to preliminary reports received by the U. S. Department of Labor. Accidents per million man-hours in steel foundries numbered 26.8, in contrast to 30.7 for the corresponding period last year. Gray-iron foundries had 32.1 accidents in the first half of this year, as against 39.7 last year, and the rate of nonferrous foundries dropped from 25.1 in 1951 to 19.7 this year. All classifications of workers are included in the survey, both technical and administrative.



Hear fundamentals, shop practices at

Michigan regional foundry conference

■ Some 375 foundrymen attended the Michigan Regional Foundry Conference October 17 and 18 to hear talks on solidification of metals, shell molding, cupola practice, nonferrous problems, gating, and nodular iron. Sponsors of the two-day meeting were the four Michigan chapters—Saginaw Valley, Western Michigan, Detroit, and Central Michigan, the University of Michigan and the Michigan State College student chapters, and the two educational institutions. The conference was under the general chairmanship of Jess Toth, Harry W. Dietert Co.

Approximately 60 students from the University of Michigan, Michigan State College, University of Detroit, Wayne University, Lawrence Technical High School, Cass Technical High School, and Hackley Manual Training School, participated in the conference. Their expenses were borne by individual firms and by the four participating A.F.S. chapters.

Following registration in the lobby of the Rackham Building, the regional opened in the Rackham Auditorium with a welcome from Engineering Dean George G. Brown. In citing the practical nature of the technical sessions to be held during the conference, he said the school tried to give its students the background in science needed to carry them through some 40 years of an engineering career. This background is not all they need however, he declared, pointing out the importance of practical experience which only industry can give. Prof. Richard A. Flinn, University of Michigan, introduced Dean Brown.

Technical meetings started with W. S. Pellini, Naval Research Laboratory, Washington, D. C., speaking on "*Solidification of Metal.*" He

Jess Toth, Harry W. Dietert Co., Detroit, Michigan Conference Chairman.

reviewed the present status of knowledge regarding mechanism of solidification and demonstrated that the concept based on bleeding tests is incorrect. The new concept, he said, is detailed in solidification curves based on the progression of start-of-freeze and end-of-freeze waves through a casting. These curves give a completely new picture of how certain casting defects occur, he explained.

Film highlights research

He showed how the solidification curves illustrate mode of solidification, and the effects of mold materials, superheat, and casting geometry. The information will eventually be developed for use in gating and feeding, he said. Chairman of Mr. Pellini's session was John F. Smith, Chevrolet Grey Iron Foundry, GMC, Saginaw, Mich.

Prof. Flinn returned to the rostrum to present a film on shell molding and to outline recent research in the field. The film depicted crankshaft production at Auto Specialties Mfg. Co., St. Joseph, Mich., and took the audience through the now-familiar steps of dumping the sand-resin mixture onto the hot pattern, curing the shell, assembling, bolting, backing up, and finally pouring.

Society activities reviewed

Collins L. Carter, Albion Malleable Iron Co., Albion, Mich., vice-president of A.F.S., spoke at the luncheon. He reviewed Society activities, calling attention to the organization's publications, the annual A.F.S. Convention to be held in Chicago May 4-8, 1953, the regional foundry conferences, Society-sponsored research, and the Safety & Hygiene & Air Pollution Program.

He gave as guiding principles for the chapters and the organization as a whole: (1) A.F.S. must rely upon the faith and good will of many men, and solicit their active interest; (2) its integrity must be constant, unimpeachable, and proof against any pressure; (3) it must condition the field it serves to consider and to embrace every potential means of progress; (4) it must advocate nothing but analyze all, selecting for dissemination only that which meets accepted high standards; and (5) it must be prepared to lend its sponsorship to activities which, while outside its own sphere, deserve industry-wide acceptance.

Mr. Carter introduced Wm. N. Davis, director of the Safety & Hygiene & Air Pollution Program. Mr. Davis said that the program was being expanded to include noise, and announced foundry health conferences to be held at the University of Illinois February 17-19, and at the University of Wisconsin March 24 and 25, 1953. A safety training course being developed with Chicago foundrymen would eventually be

made available to all foundry groups he said.

Prof. C. C. Sigerfoos, Michigan State College, who presided at the luncheon, then introduced George K. Dreher, Foundry Educational Foundation, Cleveland. Mr. Dreher outlined the formation and growth of FEF, stating that it represents an extension of the educational activities of the foundry technical, trade, and equipment and supplies organizations which founded it. He illustrated the influence of the Foundation in its five years of existence by citing the growth in engineering college foundry courses, teaching staff, and teaching facilities.

Choice of topics offered

For the afternoon, conference attendants divided into those interested in cupola practice and those interested in non-ferrous topics. At the cupola session, Fred J. Walls, International Nickel Co., Detroit, and A. W. Demmler, Campbell, Wyant, & Cannon Foundry Co., Muskegon, Mich., were co-chairmen. Speakers and their topics were: "*Malleable Iron Melting,*" Frank B. Rote, Albion Malleable Iron Co., Albion, Mich.; "*Basic Cupola Operations,*" W. W. Levi, Lynchburg Foundry Co., Radford, Va.; and "*Acid Cupola Operations,*" Howard H. Wilder, Vanadium Corporation of America, Detroit.

Control of melting is maintained in the charging and operation of the cupola while the air furnace is used only for superheating, Mr. Rote said in describing malleable duplexing operations at Albion Malleable. The company uses two 58-in., water-cooled cupolas discharging into either of two 60-ton, oil-fired air furnaces, he said. The melt exceeds 300 tons per 8-hr day.

Analyses of cupola and air furnace iron are made each half hour, and results are posted on control charts in the laboratory and melting department. Possible changes in composition of air furnace metal are predicted from the charts, according to Rote, and adjustments in cupola operation are made to stabilize the composition and keep it within the standards.

Mr. Levi described the development of a design and technique for operating a basic-lined, water-cooled, hot-blast cupola. The unit, he reported, has been successfully used for producing low-sulphur, high-carbon irons from mixtures containing up to 100 per cent steel. These irons are well suited to the production of ductile iron, can be used as a substitute for purchased pig iron, and can be poured directly into castings where high carbon irons are desirable.

Mr. Wilder described operation of acid lined cupolas in detail, citing as advantages of this type of melting unit: rapid melting, continuous operation, low initial and operating cost, long life, ease and flexibility of operation. Carbon is the most important element in gray iron, he said, and recommended controlling it by adjustments in coke type and size, the nature of the metallics in the charge, and by blast rate.

In discussing control of mechanical properties, Mr. Wilder gave as a convenient formula for tensile strength: 10,000 x (factor — 2CE). CE is the carbon equivalent calculated as the sum of the percentage of carbon plus one-third the sum of the silicon and phosphorus. Factors differ for the various standard test bars, being 11.8 for the 0.875 in. bar, 11.5 for the 1.2 in. bar, and 11.0 for the 2 in. bar.

Non-ferrous foundrymen heard three talks on copper-base alloys, aluminum alloys, and magnesium alloys at their session. Crary Davis, Aluminum Company of America, Detroit, and Ernest Frens, Michigan State College, were co-chairmen.

Speaking on factors affecting melt quality, John G. Kura, Battelle Memorial Institute, Columbus, Ohio, told of the need to control gas content as well as composition of the melt. Suitable methods for quantitative determination of dissolved gases in copper-base alloys are not available, he said, necessitating use of indirect methods such as tensile tests, fracture tests, radiographs, and density determinations.

Nonferrous alloys discussed

Oxygen content of 0.5 per cent in the products of combustion was advised by Kura. He also suggested an oxidizing slag made up of one to three parts of cuprous oxide, one part sand, and one part borax. To decrease the gas content of melts strongly reducing in composition (contain tin, zinc, or phosphorus) he recommended bubbling nitrogen through the melt.

Charles F. Maxwell, Christiansen Corp., Chicago, described the advantages and applications of the various melting furnaces used in the field of aluminum alloy melting.

In his talk on magnesium alloys, Manley E. Brooks, Dow Chemical Co., Bay City, Mich., pointed out that magnesium sand foundry operations are basically the same as with other metals, the differences being caused by the light weight, chemical activity, and low heat content. To prevent reaction between the metal and the moisture in the molding sand, he said, it is necessary to add inhibitors such as fluorides, sulphur, and boric acid, the amount required varying with the moisture content and usually ranging from three to six per cent.

Urea formaldehyde binders are usually used in cores because of their favorable knock-out characteristics, Mr. Brooks said. Core sand should have high permeability (A.F.S. Fineness 60) and cores must be vented, he warned. Superheating is the most common grain refining practice, according to the speaker, but inoculation with carbonaceous material can also be used. He advised degassing with chlorine to remove hydrogen from the melt.

Second day's program

Leaving the Michigan Union where the luncheon and afternoon sessions were held, conference attendants visited the school foundry and then went to the Washtenaw Country Club for dinner and an address by Paul Bagwell, head of the English Dept. at Michigan State College. Harry E. Gravlin, Jr., Ford Motor Co., Dearborn, Mich., was toastmaster.

Prof. Bagwell recalled the factors which led to the fall of the Roman empire to show how the United States could deteriorate and lose its standing as a nation.

Meetings on the second day started with simultaneous sessions on flow of metals and nodular iron. At the metal flow session, the latest A.F.S. research film on fluid flow was shown. At hand to discuss the film was R. F. Thomson, General Motors Corp., Detroit, chairman of the Light Metals Research Committee which directed the research. Prof. Sigerfoos and George T. Baebler, S. H. Cleland & Assoc., Detroit, were co-chairmen.

John P. Rowe, University of Michigan, introduced the speakers. They were D. J. Reese, International Nickel Co., New York, and Thomas E. Eagan, Cooper-Bessemer Corp., Grove City, Pa. Mr. Reese distinguished between flake graphite, temper carbon, and spheroidal carbon, and illustrated the influence of

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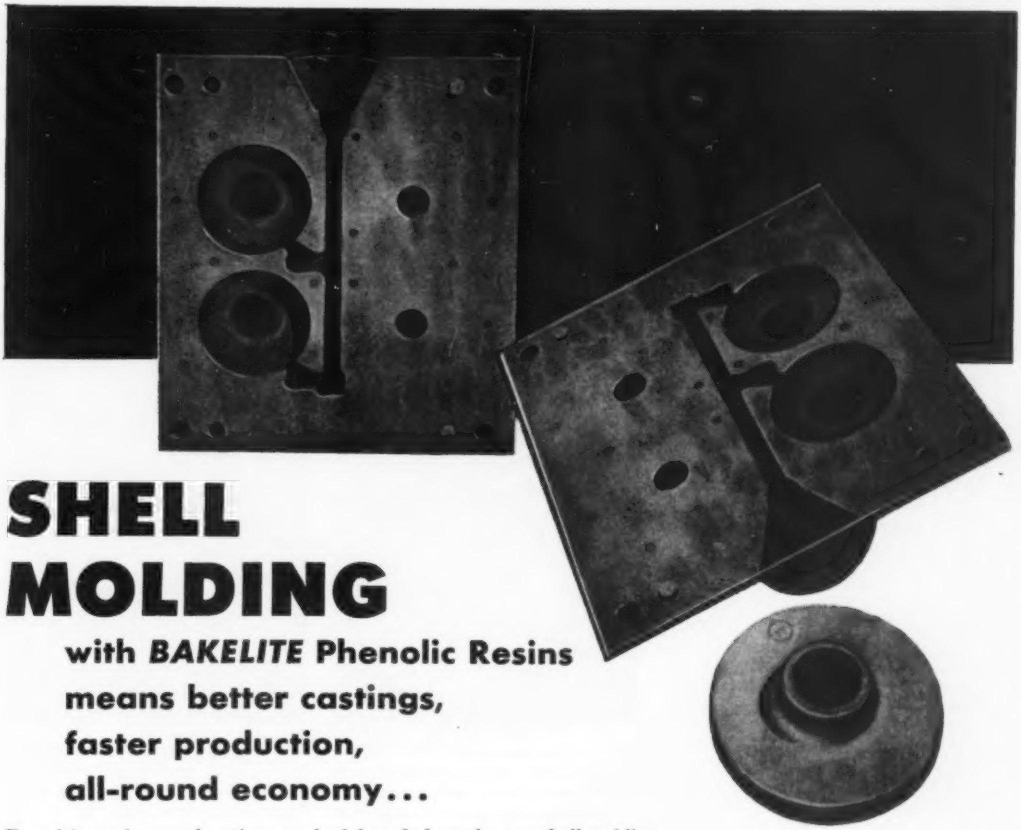

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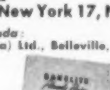

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Quality control, labor relations studied by *Gray Iron Founders' Society*

■ Gray iron foundrymen from nearly every state attended the 24th annual meeting of the Gray Iron Founders' Society in the Cleveland Hotel, Cleveland, October 16 and 17. Following a program of committee reports, a quality control session, and talks on labor relations, engineering in a sales program, and price and materials control problems, GIFS elected as president for 1952-53 Henry J. Trenkamp, Ohio Foundry Co., Cleveland. New vice-president is Thomas I. Curtin, Waltham Foundry Co., Waltham, Mass. C. H. Ker, Dalton Foundries, Inc., Warsaw, Ind., was named secretary; new treasurer is Walton O. Larson, W. O. Larson Foundry Co., Grafton, Ohio. Donald H. Workman continues as executive vice-president.

Other highlights of the second day's luncheon, when new officers and directors were announced, were the presentation of awards for industry service and prizes in the 1952 Redesign Contest. A gold medal was presented to C. R. Culling, Carondelet Foundry Co., St. Louis, by Retiring President E. K. Roth, Motor Castings Co., West Allis, Wis., for Mr. Culling's contributions to GIFS as president and member of committees on costs, handbook, statistics, and technology, and for his work on government advisory committees.

Citations were presented to: John A. Claussen, Pig Iron Section, Iron and Steel Div., National Production Authority, Washington, D. C.; James S. Vanick, International Nickel Co., New York; Edward B. Smith, American Brake Shoe Co., New York; and A. J. McDonald, Ferrous Castings Section, Iron and Steel Div., NPA.

Sharing equally in the $500 prize money offered in the Redesign Contest were: W. F. Geppert, Acme Foundry Inc., Tacoma, Wash.; George K. Green, Textile Machine Works, Reading, Pa.; A. C. Hauser, American Hydrovac Div., Pitz Foundry, Inc., Brooklyn, N. Y.; Frederick Waters, Seneca Falls Machine Co., Seneca Falls, N. Y.; and Alfred J. Schmidbauer, Iroquois Foundry Co., Racine, Wis. (Winning entries will be described and illustrated in the December issue of AMERICAN FOUNDRYMAN.)

Henry J. Trenkamp (left), Ohio Foundry Co., Cleveland, new president of GIFS, and Thomas I. Curtin, Waltham Foundry Co., Waltham, Mass., new vice-president.

C. R. Culling (left), Carondelet Foundry Co., St. Louis, receives gold medal from retiring GIFS president E. K. Roth, Motor Castings Co., West Allis, Wis.

On the program for the first day following the annual reports of committees was George K. Dreher, Foundry Educational Foundation, Cleveland. He outlined the progress made by the Foundation with the cooperation of the foundry industry and showed how FEF has been instrumental in improving foundry educational facilities in a number of schools, and has increased the number of engineering college students entering the industry.

Luncheon speaker was Carl Taylor, Waukesha State Bank, Waukesha, Wis. He said his studies of history show that people can organize their living in two ways: (1) delegate to others or lose their power to think, plan, and own; or (2) retain the power to decide who shall rule and to change the rules. He reviewed the trend away from the latter and reminded his audience they still had the power to halt the trend and return the United States to normal.

Luncheon speaker the second day was Prof. George W. Taylor, University of Pennsylvania, Philadelphia. The nature of industrial relations depends more on labor and management than on the government, he said, pointing out that management has an obligation to take the initiative in the matter. Management has a real incentive because industrial relations have created a new competitive factor.

In the quality control session the afternoon of the first day, W. J. Sommer, Plainville Casting Co., Plainville, Conn., outlined a quality control program for a small foundry. T. W. Curry, Lynchburg Foundry Co., Lynchburg, Va., showed how many tools are available for quality control in a mechanized foundry. H. W. Stuart, U. S. Pipe & Foundry Co., Burlington, N. J., presided.

How to encourage young men to enter the foundry industry

Recruiting new blood for the foundry industry is a joint responsibility of management and organized foundry groups. Management's job, the internal phase of the work, and chapter educational committee activities, the external phase, are outlined in this story condensed from a report of the A.F.S. Youth Encouragement Committee by its enthusiastic and hard-working chairman, Earl Strick.

EARL M. STRICK / *Finishing Supt., Erie Malleable Iron Co., Erie, Pa.*

■ Bringing a sufficient number of young men into the foundry industry to meet its needs is a world-wide problem, it was discovered by foundrymen attending the International Foundry Congress in Atlantic City. In the United States, the Foundry Educational Foundation is one of the strongest factors in relieving the shortage of foundry engineers. But molders, coremakers, grinders, and other workers are needed on the team that produces the castings.

What management can do

To fully cover the field of recruiting, the Youth Encouragement Committee of A.F.S. has divided the work into internal and external activities. The internal phase is best carried out by management while the burden of promoting the external phase is expected to be, and to a great extent in some areas is, carried by the educational committees of the various chapters of the Society.

Here is an outline of management's responsibilities in the internal phase of the work.

1. Good Housekeeping. Provide and maintain clean and orderly departments, modern shower and locker rooms, adequate dust and smoke control, and proper lighting.

2. Mechanization. Carry on a continual program of applying modern equipment to production as well as to the services allied to production. Make maximum use of devices and machines to keep excessive manual effort at a minimum.

3. Personnel. Management must assume the responsibility for the individual development of the workers. A program should be developed in each plant to facilitate workers' education and their recognition of company benefits. New workers should be checked at intervals regarding their interest in foundry work. By encouraging plant visits by school groups, management will stimulate interest in the foundry as a career.

4. Safety. This is a responsibility of each supervisor but all must have the backing of safety-minded management. Necessary safety equipment needs to be provided. Regular inspections for hazards should be conducted with follow up and corrective measures.

5. Training. An indoctrination program for new workers enables them to see the entire operation as well as their own work. For all workers, there should be adequate communication channels so policies and ideas can be readily transmitted and received.

Job training calls for a clearly defined training program in the fields of craft apprenticeship, supervisory training, and management and executive training. Other types of training which are beneficial include cooperative training and summer work for students.

Public relations outline

The external phase of youth encouragement, which can be promoted by chapter educational committees, includes the following:

1. Publicity. This can take the form of: newspaper, radio, and television releases and programs; talks about the foundry industry to local groups; showing of movies on the industry to civic, professional, and school groups.

2. Guidance. Consult with school officials about foundry work. Help institute and support historical and technical foundry classes. Furnish foundry occupational information to guidance teachers and counselors. Mail brochures concerning the industry to all male high school graduates as well as to college graduates.

Plan visitations for college and school groups to the most representative foundries of the community. Encourage foundries to "adopt" a nearby technical or high school and keep it supplied with foundry information. Inform school heads and interested students about the Foundry Educational Foundation.

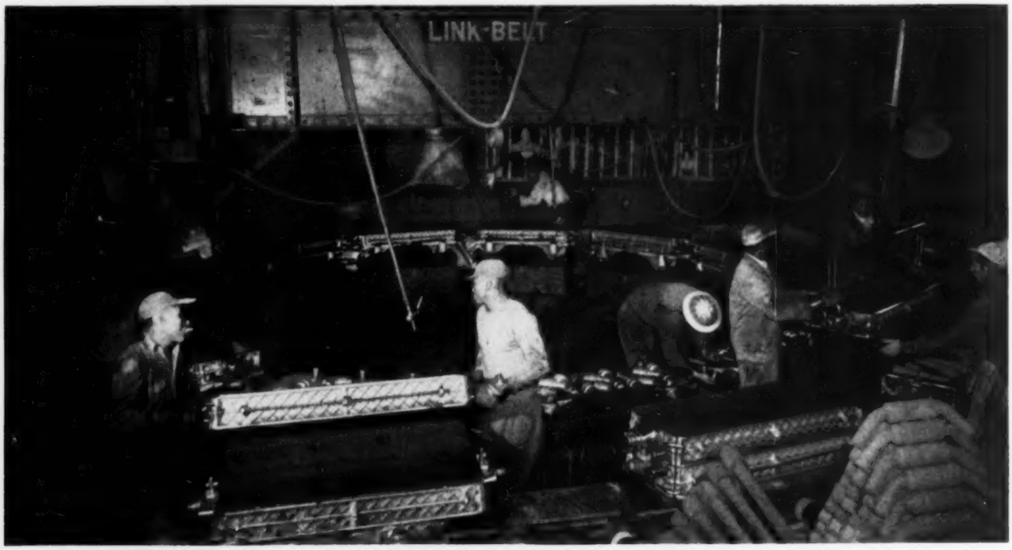
3. Employment Agencies. Enlist the cooperation of local, state, and government employment representatives. Encourage them to prepare foundry job brochures, and to analyze and advise on applicants' objections to foundry work. Have them meet with chapter educational committees to discuss and formulate youth encouragement programs.

All foundries benefit

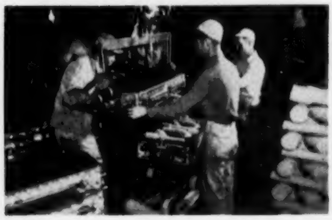
These suggestions are broad enough to cover small or large foundries and any kind of a community. Every foundry and every foundry group will find certain of the suggestions to their liking and will be able to apply them successfully.

One project that foundries and foundrymen should work at constantly wherever the need exists is the correction of the erroneous impression that the foundry is not a good place in which to work. Chapter educational committees here have a rare opportunity to point out to management that this erroneous opinion may be chiefly responsible for keeping young men from entering the foundry field seeking careers. Working conditions in foundries, as in other industries, have improved through the years and some foundries are not only ahead of their own industry but ahead of many other industries as well. The story needs constant telling—"The Foundry Is a *Good* Place to Work!"

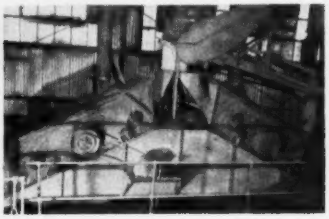
LINK-BELT helps Central Foundry step up production



1 Mechanization by Link-Belt at Central Foundry Co., Holt, Alabama, has resulted in increased production and better working conditions. Continuously moving Tru-Trac mold conveyor, above, is 110 ft. long.



2 After cores have been set, molds are closed. Tru-Trac Conveyor continues to pouring station, thence through cooling zone to central shakeout point.



3 Twin UP Vibrating Screens over the storage bin receive sand from elevator and shakeout via belt conveyor. Large sand capacity necessitates dual installation.

4 Uniform and proper sand conditioning is continuously obtained at Central Foundry. Two muller type mixers shown here prepare and cool the sand.

5 Tilting top trays discharge molds to shakeout. Castings go over end of shakeout screen to apron conveyor. Complete mold, sand and castings handling equipment was designed, built and installed by Link-Belt.

If you have a mechanization or sand preparation problem in your foundry, a Link-Belt foundry engineer will be glad to discuss it with you or your consultants. For complete information, call the Link-Belt office near you.

LINK-BELT

CONVEYORS and PREPARATION MACHINERY

FEMA

LINK-BELT COMPANY: Chicago 9, Indianapolis 6, Philadelphia 40, Atlanta, Houston 1, Minneapolis 5, San Francisco 24, Los Angeles 33, Seattle 4, Toronto 8, Springs (South Africa), Sydney (Australia). Offices in Principal Cities. 12,828

Foundry Equipment Manufacturers' Association

Foresees business at 1952 level

■ Annual survey of business activity, product group meetings, price and materials controls, and recognition of past presidents were high on the list of activities at the 34th annual meeting of the Foundry Equipment Manufacturers' Association held October 16-18 at The Greenbrier, White Sulphur Springs, W. Va. Other program features included election of officers for the coming year and adoption of a resolution of appreciation of friendly relations existing between FEMA and the Italian Foundry Equipment Manufacturers' Association.

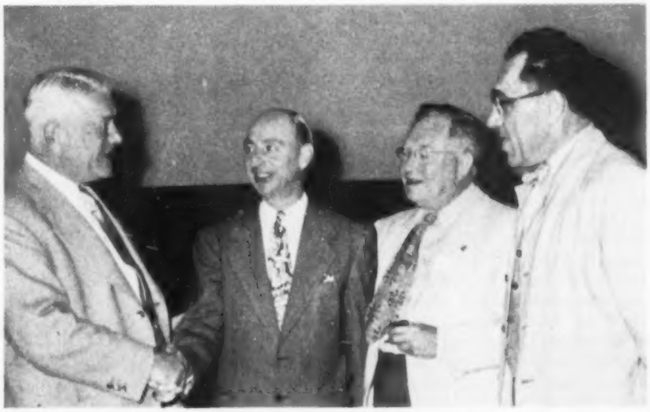
New president of FEMA is Claude B. Schneible, Claude B. Schneible Co., Detroit. W. B. Wallis, Pittsburgh Lectromelt Furnace Corp., Pittsburgh, was elected vice-president. In addition to Mr. Schneible, new directors include G. E. Seavoy, Whiting Corp., Harvey, Ill., and P. F. Bauer, Allis-Chalmers Mfg. Co., Cleveland.

Arthur J. Tuscany, executive secretary of FEMA, reports that an entire day was devoted to a study of the need for and development of new equipment. Also considered by the six product groups were methods of improving engineering and manufacturing practices.

Following the annual survey of present and probable future business activity, association members concluded (though not unanimously) that business in 1953 would be at approximately the same level as the 1952 average. Increased mechanization of small and medium shops was foreseen.

During the open forum discussion of 14 questions relating primarily to plant operations and business management, particular attention was given to the technical problem of designing all types of foundry production equipment to make dust control more effective. The subject also was considered during the meetings of the Dust and Fume Control Product Group.

A.F.S. President I. R. Wagner, Electric Steel Castings Co., Indianapolis, congratulated the equipment manufacturers on their contributions to foundry progress and pointed out that they have a large role to play in the industry's Safety & Hygiene & Air Pollution Program. Wm. W. Maloney, secretary-treasurer of A.F.S., stressed the importance of co-operation between equipment manufacturers and operating foundrymen, and outlined the role A.F.S. plays in bringing the two groups together.



Claude B. Schneible, Claude B. Schneible Co., Detroit (left), new president of the Foundry Equipment Manufacturers' Association, receives congratulations from (left to right): C. V. Nass, Beardsley & Piper Div., Pettibone Mulliken Corp., Chicago, retiring president; W. B. Wallis, Pittsburgh Lectromelt Furnace Corp., Pittsburgh, vice-president for 1952-53; and Arthur J. Tuscany, FEMA executive secretary. Photographs are by Irv Dennen, Beardsley & Piper Div., Pettibone Mulliken Corp.

I. R. Wagner, Electric Steel Castings Co., Indianapolis, national president of A.F.S., addressing manufacturers.

A.F.S. Secretary-Treasurer Wm. W. Maloney, Chicago, was one of the speakers at the annual FEMA meeting.

German foundrymen meet for 43d annual convention

DR. E. HUGO / *Secretary, Association of German Foundrymen, Düsseldorf*

■ More than 1300 foundrymen—about 60 of them from other nations—attended the 43rd annual assembly of the Association of German Foundrymen September 25 to 27. The convention met in the Robert Schumann Hall, in Düsseldorf.

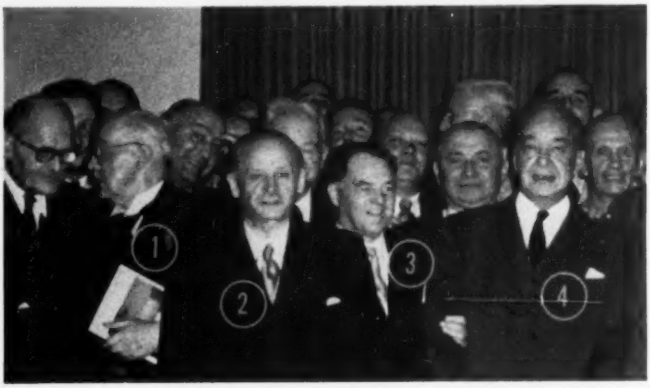
Only recently have delegates from foreign foundry associations been able to attend and take part in the Association's meetings. Among these, to name a few, were H. Baehr and G. Henon, representing France; R. Doat, Belgium; V. C. Faulkner, England; H. Hertlein, Austria; E. O. Lissell, Sweden; Ove Hoff, Denmark; M. Olivo, Italy; E. Schmitt, the Saar; and J. Wulff, of the Massachusetts Institute of Technology, Cambridge. Other nations represented were Norway, Holland, Switzerland, and China. Participation of the visiting delegates was especially heartening to their hosts.

Reports and technical papers presented at the business sessions covered economic, sociocultural, and personnel aspects of foundry operation and management as well as topics relating specifically to the more narrowly technical problems affecting the industry.

As an example of the Association's interest in foundry matters that affect the public can be cited the address, delivered by Prof. Zenneck, emphasizing the industry's responsibility for helping to rebuild the German Museum at Munich. Prof. Zenneck is head of the Museum, and his appearance emphasized the importance of this project.

Other addresses illustrating contributions of the foundry industry to cultural progress were those by Prof. Deckert and H. Jungblut. Prof. Deckert spoke on the cultural inheritance and creative powers of technology. Mr. Jungblut's thesis was concerned with the contributions of foundrymen to technologic progress.

Summed up in the words of the convention report, "the busy sessions in Düsseldorf should indicate to the public that scientific and technical associations, especially the Association of German Foundrymen, do not maintain a passive attitude on cultural problems but, on the contrary, that they do contribute much to their solution."



Delegates representing 60 nations attended the 43rd annual conference of the Association of German Foundrymen, held in Düsseldorf, Germany, September 25-27. Among those attending were: 1) Vincent C. Faulkner, editor, The Foundry Trade Journal, London, England; 2) J. H. Küster, president, Association of German Foundrymen, Düsseldorf; 3) Mario Olivo, Impianti Fonderie Olivo, Milan, Italy; 4) Prof. J. Wulff, Massachusetts Institute of Technology, Cambridge, Mass.

Technical papers presented a variety of problems and suggested solutions. For example, Dr. W. Patterson discussed the question of heat balance in hot-blast and cold-blast cupolas. Dr. Wübbenhorst spoke on the technical and economic problems concerned in producing and using foundry coke. The influence of pig iron and scrap in the quality of malleable cast iron was the topic discussed by Dr. H. Siegel. Dr. J. Willems summarized the experience gained by using pig-casting machines in the casting of hematite and foundry pig iron.

Other discussions were equally significant. For instance, Dr. K. Roesch spoke on desulphurization of cast iron and malleable cast iron with lime and coal dust. Dr. H. Schmidt compared the costs of basic and acid processes in cupolas, and Dr. Kramer discussed air placement of cupola linings.

Discussions of a more generalized nature covered the organization and uses of foundry laboratories, the education of apprentices, and the probable cost of reorganizing industrial establishments to conform to the principles of scientific management. Speakers who dealt with these topics were Dr. Roll, H. Pieper, and H. Krippendorf respectively.

Social aspects of the assembly were, of course, well provided for. On the second day of the conference the wives of delegates attended a style show of the latest fall and winter fashions. Delegates and ladies were also entertained in the Rheinhall where there was adequate opportunity to promote new friendships and renew old acquaintance among the industrial fraternity.

FOR FASTER, EASIER, LOWER COST FINISHING OF GRAY IRON CASTINGS

'NISILOY'*

(NICKEL-SILICON-ALLOY)

• WHAT IT IS

"NISILOY" is an inoculant with positive graphitizing power. It contains about 60% nickel, 30% silicon, balance essentially iron. Its remarkably low melting point of 1800° F. and relatively high specific gravity causes it to dissolve quickly in liquid iron.

Photo of 1" chill test bars show advantages of Nisiloy. In each pair, wedge on left is white, and was cast without Nisiloy. Right hand wedges used progressively 1 to 1½% Nisiloy. Notice complete elimination of hard white iron on specimen at extreme right.

• WHAT IT DOES

"NISILOY" improves machinability . . . it provides a dense, gray, easy-to-machine structure that reduces machine shop costs.

Use of 1% Nisiloy in these cylinder castings eliminated machining troubles from hard spots in light sections, raised output, reduced rejects and cut final costs.

• HOW TO USE IT

"NISILOY" is simply added to the ladle. Additions of from .25 per cent to 1.00 per cent usually prove sufficient for structure control. Improve quality and quantity of your output. Get full information . . . mail the coupon now.

*Trade Mark of The International Nickel Company, Inc.

Nisiloy helps you control properties of gray iron for casting parts with varied cross sections that tend to create chilled surface areas. Its use eliminated machining troubles, and provided a dense, uniform close-grained microstructure in these bonnets, slide valves and bushing.

EMBLEM OF INCO SERVICE
TRADE MARK

At the present time, the bulk of the nickel produced is being diverted to defense. Through application to the appropriate authorities, nickel is obtainable for the production of engineering alloys for many end uses in defense and defense-supporting industries.

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Dept. AF, 67 Wall Street, New York 5, N. Y.
Please send me your booklet entitled, "NISILOY" for GRAY IRON CASTINGS.

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Company ....
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City .... State ....

THE INTERNATIONAL NICKEL COMPANY, INC. 67 WALL STREET NEW YORK 5, N. Y.

chapternews

Directors of the Chicago Chapter who met prior to the October session to discuss future activities include (left to right) Vice-President John A. Rassenfoss, Cecil F. Semrau, Walter W. Balton, Robert Hendry, Harold G. Haines, Fred L. Riddell, President John H. Owen, B. C. Yearly, Robert P. Schauss, C. V. Nass, Walter W. Moore, and Frank B. Flynn.

Philadelphia

DANIEL E. BEST
Bethlehem Steel Co.

The October Meeting of the Philadelphia Chapter of A.F.S. held at the Engineer's Club, was a joint meeting with ASM and was attended by more than 300 persons.

Subject of the meeting was "*Quality Control.*" Guest speakers were: Henry Winte, Florence Pipe Foundry & Machine Co., Florence, N.J., and Edward Shrock, Lukens Steel Co., Coatesville, Pa. Technical Chairman of the meeting was H. N. Stuart, U. S. Pipe & Foundry Co., Burlington, N. J.

A few excerpts from the speakers' remarks follow: Quality control should be under the direction of one man. He should be a man with technical training with some foundry experience, be quality conscious, be able to get along with people and gain the confidence of the operating personnel.

Quality control is directly dependent upon the correct analysis of casting defects. (It developed during the discussion following the talks that the best method of consistently judging defects was to use the A.F.S. book entitled *Analysis of Casting Defects*). Defects must be correlated with practices which may be the cause of scrapped or otherwise defective castings. In case of iron castings, for instance, checks may be made against records of chemical tests, chill tests, sand tests, pouring temperatures, etc.

Control of sand properties is most

Enjoying quip just before September meeting of Northwestern Pennsylvania Chapter are (left to right) Chairman Fred Carlson, Weil-McLain Co., Erie, Pa., Guest Speaker Richard Herold, Borden Co., New York, and Bailey Herrington, Williams & Co., Erie.

"Lamplighters" John A. Rassenfoss, American Steel Foundries, Chicago, and John H. Owen, Harbison Walker Refractories Co., Chicago, work feverishly on a faulty light cord. Got it fixed in time to provide light for speaker's desk during Chicago Chapter's October meeting.

In a huddle after September meeting of Eastern New York Chapter are (left to right) Earle Aumic, one of the speakers of the evening, Harold Williams, William Fraboski, and Edward Stresino, all of Schenectady Foundries, General Electric Co., Schenectady, N. Y.

important in any quality control work. Pattern equipment must be maintained in good shape.

Quality control depends on ability to measure and becomes largely a problem of successful duplication of conditions.

There can be no overnight correction by adoption of a quality control program. However, quality control means predictability with assurance and this means keeping and using records.

Oregon Chapter

NORMAN E. HALL
Electric Steel Foundry Co.

At its initial meeting of the current year, the chapter had as speaker S. C. Massari, technical director, A.F.S., who described the Society's work in producing the series of films on fluid flow in transparent molds. The third film in this series entitled "*Effect of Gating Design* on Casting Quality" was shown at the meeting.

The film illustrated the experiments with a horizontal gating system and a horizontal plate casting. The experiments based on the runner being reduced by the area of each in-gate passed, to obtain equal distribution in the mold cavity, were illustrated using three types of sprue base designs.

Chairman Wm. Halverson, Electric Steel Foundry Co., Portland, Ore., announced the names of Committee Chairman to handle the various chapter activities for this year as follows: Membership, Henry Ernstrom, J. E. Haseltine Co., Portland, Ore.; Education, C. N. Wilcox, Electric Steel Foundry Co., and F. A. Stephenson, Dependable Pattern Inc., Portland, Ore., Co-chairman; and Publicity, Norman E. Hall, Electric Steel Foundry Co.

Chicago

Shell molding process developments have outstripped equipment developments Bernard N. Ames, New York Naval Shipyard, Brooklyn, N.Y., told members of the Chicago Chapter at the group's October 6 meeting. Shell molding is not a panacea, he warned, and in the long run will be used to produce only a small percentage of the castings now made in solid sand molds. Superior finishes are obtained if five or six-screen sands are used, he said, adding that zircon sands can be used but are more expensive than silica sands.

The sand and resin (two-stage preferred for better shelf life) can be mixed in any of the conventional mullers, in a cement mixer, or in any dry mixer, Mr. Ames stated. Temperature during mixing must be kept down and the mixer should be hooded to prevent spread of resin dust. Wetting agents or a small fraction of a per cent of kerosene can also be used to prevent dusting.

Ames described shell molding practice at the shipyard and showed illus-

Photogenic trio at October meeting of the Wisconsin Chapter includes Wm. J. Grede, President of N.A.M. and speaker of the evening, and Arthur L. Grede, both of Grede Foundries, Inc., Milwaukee, and Milwaukee Chapter President Joseph G. Risney, The Joseph G. Risney Foundry Equipment Co., Wauwatosa, Wis.

Conferring on agenda for Central Illinois Chapter's October meeting are (left to right) President George H. Rockwell, Caterpillar Tractor Co., Peoria, Ill., A. V. Martens, Pekin Foundry, Pekin, Ill., and Speaker Kenneth W. Haagensen, Allis-Chalmers Mfg. Co., Milwaukee, Wis.

Examining core at October meeting of Metropolitan Chapter, Chairman James S. Vanick (left), International Nickel Co., New York, Clinton F. Zabriske (center), Sperry Gyroscope Co., Lake Success, N. Y., confer with Guest Speaker Richard Herold, Borden Co., New York, who spoke to the chapter on the subject: "Resin Core Binders, Ferrous and Non-Ferrous."

trations of a number of castings currently being made there. All castings cannot be produced by shell molding, he said, recommending that each casting be considered separately for potential shell casting. John A. Rassenfoss, American Steel Foundries, East Chicago, Ind., presided at the technical session.

At the start of the meeting, Chapter Chairman John H. Owen, Harbison Walker Refractories Co., Chicago, called on Harold G. Haines, Howard Foundry Co., Chicago, educational chairman for the chapter, to introduce the foundry instructors from Chicago schools who were present. Mr. Haines complimented the instructors on the work they are doing with foundry students who, he said, are the future leaders of the foundry industry.

Wm. N. Davis, director of the A.F.S. Safety & Hygiene & Air Pollution Program, announced a course in fundamentals of foundry safety being put on with Chicago-area talent. He said the course was expected to be a pattern for similar courses to be held in other foundry centers.

Central Illinois

L. E. KINSINGER
Caterpillar Tractor Co.

The first regular 1952-53 meeting of the Central Illinois Chapter was held October 6 in American Legion Hall. Technical Chairman A. V. Martens, Pekin Foundry, introduced Kenneth W. Haagensen, Allis-Chalmers Mfg. Co., Milwaukee, who spoke on *"What Kind of a Salesman are You?"*

Mr. Haagensen said everyone is a salesman. Laborers are selling their labor; foremen are selling themselves to management and labor; and salesmen are selling their material products. Consequently, we should act like salesmen and stress the plus values of our work and our American way of life.

In keeping with good salesmanship, troubles should be discussed only where something can be done about them; not where other people hearing them, might get the wrong impression because all the facts are not available. People are always present who feed upon dissatisfaction and use it as a wedge to sell us something else, Mr. Haagensen declared.

Southern California

K. F. SHECKLER
Calmo Engineering Co.

Approximately 100 members and guests of the Southern California Chapter of the American Foundrymen's Society, convened at Rodger Young Auditorium on October 10, for the second meeting of the 1952-53 season. Hubert Chappie, National Supply Co., Torrence, Calif., arranged the technical session in the form of a clinic on Problem Iron Castings. The speakers panel consisted of: James E. Eppley, Axelson Manufacturing Co., B. M. Campbell, Dayton Foundry, Robt. Gregg, Reliance Regulator Div., American Meter Co., and H. W. Howell of Howell Foundry. Each member of the panel cited an example of a casting which had been a problem to manufacture in their shop, and explained how they were able to overcome the difficulty. Most of the foundrymen in the audience participated in the discussion.

Saginaw Valley

ROY S. DAHMER
Eaton Mfg. Co.

The Saginaw Valley Chapter opened its 1952-53 season October 2 with a meeting featuring the A.F.S. film *"Effect of Gating Design on Casting Quality"* shown by S. C. Massari, technical director of the American Foundrymen's Society. Mr. Massari spoke on the flow of metal in molds, and illustrated his talk with a movie, *"Fluid Flow in Transparent Molds."* Mr. Massari also led the discussion session.

Among the guests introduced were Messrs. Ross and Harris from Birlec, Ltd., Birmingham, England.

N.W. Pennsylvania

ROY A. LODER
Erie Malleable Iron Co.

Foundrymen of Northwestern Pennsylvania met for their September meeting in the Blue Room of the Erie Moose Club. Guest speaker was Richard Herold, Borden Co., New York, who spoke on shell molding.

Mr. Herold's talk (see August 1952 issue of AMERICAN FOUNDRYMAN) brought out a vast amount of information. Discussed were the various types of equipment used for making shell molds, methods of clamping the shells together for pouring, and the types and amounts of sands and resins used.

A film entitled *"The Invisible Shield"*, furnished by the Claude B. Schneible Co., Detroit, was shown. It dealt with dust and fume control in the foundry industry.

Eastern New York

HOWARD H. BODWELL
General Electric Co.

The foundrymen of Eastern New York spent a full afternoon and evening together as a part of their program for their September meeting. During the afternoon a plant visitation was sponsored by the Rensellaer Valve Co., Cohoes, N. Y. The tour took visiting foundrymen through the iron and brass foundries and machine shop.

The chapter meeting was held at Circle Inn, Lathams, where members learned that their chapter had already made its membership quota. Guest speakers were Earl Aumic, Schenectady Foundries, General Electric Co.,

Central figures at Corn Belt Chapter Charter presentation in October were President Earl White (left), Paxton-Mitchell Co., Omaha, David Zuege (center), Sivyer Steel Co., Milwaukee, Wis., Wm. W. Maloney, Sec'y Treas. of A.F.S. Photo by G. Smith, Paxton-Mitchell Co., Omaha.

Chow time at September meeting of Washington Chapter finds Speakers E. J. McAfee (left), Puget Sound Naval Shipyard, Bremerton, Wash., and S. C. Massari, A.F.S. Technical Director, with Chapter Chairman J. F. Dolansky, Griffin Wheel Co., South Tacoma, Wash.

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Southern California

K. F. SHECKLER
Calmo Engineering Co.

Approximately 100 members and guests of the Southern California Chapter of the American Foundrymen's Society, convened at Rodger Young Auditorium on October 10, for the second meeting of the 1952-53 season. Hubert Chappie, National Supply Co., Torrence, Calif., arranged the technical session in the form of a clinic on Problem Iron Castings. The speakers panel consisted of: James E. Eppley, Axelson Manufacturing Co., B. M. Campbell, Dayton Foundry, Robt. Gregg, Reliance Regulator Div., American Meter Co., and H. W. Howell of Howell Foundry. Each member of the panel cited an example of a casting which had been a problem to manufacture in their shop, and explained how they were able to overcome the difficulty. Most of the foundrymen in the audience participated in the discussion.

Saginaw Valley

ROY S. DAHMER
Eaton Mfg. Co.

The Saginaw Valley Chapter opened its 1952-53 season October 2 with a meeting featuring the A.F.S. film *"Effect of Gating Design on Casting Quality"* shown by S. C. Massari, technical director of the American Foundrymen's Society. Mr. Massari spoke on the flow of metal in molds, and illustrated his talk with a movie, *"Fluid Flow in Transparent Molds."* Mr. Massari also led the discussion session.

Among the guests introduced were Messrs. Ross and Harris from Birlec, Ltd., Birmingham, England.

N.W. Pennsylvania

ROY A. LODER
Erie Malleable Iron Co.

Foundrymen of Northwestern Pennsylvania met for their September meeting in the Blue Room of the Erie Moose Club. Guest speaker was Richard Herold, Borden Co., New York, who spoke on shell molding.

Mr. Herold's talk (see August 1952 issue of AMERICAN FOUNDRYMAN) brought out a vast amount of information. Discussed were the various types of equipment used for making shell molds, methods of clamping the shells together for pouring, and the types and amounts of sands and resins used.

A film entitled *"The Invisible Shield"*, furnished by the Claude B. Schneible Co., Detroit, was shown. It dealt with dust and fume control in the foundry industry.

Eastern New York

HOWARD H. BODWELL
General Electric Co.

The foundrymen of Eastern New York spent a full afternoon and evening together as a part of their program for their September meeting. During the afternoon a plant visitation was sponsored by the Rensellaer Valve Co., Cohoes, N. Y. The tour took visiting foundrymen through the iron and brass foundries and machine shop.

The chapter meeting was held at Circle Inn, Lathams, where members learned that their chapter had already made its membership quota. Guest speakers were Earl Aumic, Schenectady Foundries, General Electric Co.,

Central figures at Corn Belt Chapter Charter presentation in October were President Earl White (left), Paxton-Mitchell Co., Omaha, David Zuege (center), Sivyer Steel Co., Milwaukee, Wis., Wm. W. Maloney, Sec'y Treas. of A.F.S. Photo by G. Smith, Paxton-Mitchell Co., Omaha.

Chow time at September meeting of Washington Chapter finds Speakers E. J. McAfee (left), Puget Sound Naval Shipyard, Bremerton, Wash., and S. C. Massari, A.F.S. Technical Director, with Chapter Chairman J. F. Dolansky, Griffin Wheel Co., South Tacoma, Wash.

"Unincorporated, uninhibited . . . and unemployed" was the description (not more than 66⅔ per cent correct) given of himself by William T. (Bill) Bean, Consultant, speaking at Twin-City Chapter's September meeting.

Schenectady, and Roy Willey of the same company.

The subject of Mr. Aumic's address was *"Foundry Pre-Planning from Blueprints."* Mr. Willey gave the group an insight into a new method of mold evaluation.

Wisconsin Chapter

H. W. SCHWENGEL
Modern Equipment Co.

Members of the Wisconsin Chapter enjoyed a movie and a complete discussion on mechanization in molding at the gray iron group meeting September 12. Speaker was C. V. Nass, Beardsley & Piper Div., Pettibone Mulliken Corp., Chicago. He pointed out that no system of mechanization will apply to all foundries. Mechanization depends upon many factors, the basic one being the structure of the company. Tonnage and location are also important factors, along with whether the foundry is a job shop, and the seasonal character of its work.

A comparison of old and new methods of cope and drag work made up a major part of a movie shown by Mr. Nass. One of the most interesting points shown is the performance of two slinger heads placed in tandem. Their motion and cycle smoothly and quickly filled comparatively small molds from permanent positions over the automatic molding units.

Eastern Canada

W. C. ROWE
Crane, Ltd.

"Make Better Castings" was the subject at the October meeting of the Eastern Canada Chapter. Guest speakers were Robert A. Colton, and Donald L. LaVelle, Federated Metals Div., American Smelting & Refining Co., Barber, N. J.

In the opening portion of the joint address, Mr. Colton explained that the two speakers would deal with problems in the selection of alloys melting, and gates and risers. Mr. LaVelle was to deal with aluminum alloys while Mr. Colton spoke about bronze alloys.

Mr. LaVelle pointed out initially that one must know the service for which a casting is to be used in order to select the proper alloy. Alloys especially suited for pressure castings have low machinability qualities, for instance. The speakers agreed that selection of alloys for both aluminum and bronze castings follows the same pattern. The point emphasized over and over again was that in order to make good castings it is necessary to select the correct alloy.

Student officers of the Penn State Chapter (left to right) are Frank Yurkoski, Co-Sec'y., Basil Farbanish, Treas., Richard Reich, Chairman, John Harrington, Vice-Chairman, and Fred Bigony, Co-Sec'y. Photo was taken by Theodore M. Frazell, Publicity Chairman, at the Chapter's organization meeting in September. Speakers included Chairman Reich, Faculty Advisor W. P. Winter, and T. C. Jester, Darling Valve & Mfg Co., Williamsport, Pa.

Mr. LaVelle pointed out that overheating during melting should be avoided since solubility of hydrogen increases with temperature. Considerable care should be exercised in the storing of aluminum alloys. A sheltered dry place is recommended.

In melting bronze alloys, Mr. Colton advised they be melted as fast as possible using an oxidizing flame and deoxidizing before pouring. Again, as is true of aluminum, excessive stirring is not desirable. For high leaded bearing bronzes a reducing flame has proven successful in many cases. In general the same care should be exercised in pouring bronze as was recommended for aluminum alloys.

Morris McQuiggan, C.O. Clark Bros., Lachine, Que., served as technical chairman for the meeting.

Cincinnati

DAVID PUSACK
Cincinnati Milling Machine Co.

What is the proper approach to the elimination of casting defects? What are the specific problems encountered? These were some of the questions discussed by W. A. Hambley, Charles A. Krause Milling Co., Milwaukee, at the October meeting of the Cincinnati chapter.

Mr. Hambley, who is chairman of the A.F.S. Casting Defects Committee, stressed the economic aspects of both scrap and salvage operations. He subdivided casting defects into two broad categories. The first included such defects as shift, short pour, misrun, rough castings, crush, etc. These he said are defects whose nature is readily discernible and which require going back to the basic source to accomplish the correction. The second category of defects, according to Mr. Hambley, includes blows, pin holes, shrink, bleeders, inclusions, and the like. Prevention of such defects requires teamwork and analytical thinking on the part of the entire organization. Poor morale, he believes, is one of our greatest scrap producers.

Missouri School of Mines

SIDNEY J. COLE
Chapter Reporter

The first meeting of A.F.S. at Missouri School of Mines was enjoyable, informative, and once again well attended by the foundrymen of the St. Louis area.

Speaker was S. C. Massari, technical director of the Society. He described A.F.S.-sponsored research work leading to the development of better gating methods. Researchers used a transparent plastic mold and water as a working fluid. Problem was to find how to eliminate turbulence, gas pockets, and dross by examining the action of the water in the transparent molds. A film showing findings was shown to the

chapter to supplement Mr. Massari's speech. The results of the study were applied to the actual casting of metals and castings of high quality were obtained.

Toledo

W. E. DRAGER
Bunting Brass & Bronze Co.

The new season for Toledo started October 1 with a dinner meeting at the Toledo Yacht Club. During the business session that followed the dinner, Chairman John M. Blake, Alloy Founders Inc., presented a retiring chairman's pin to John A. Mescher, Unitcast Corp., in appreciation of his services to the chapter during the past season.

Vice-Chairman and Program Director Bernard J. Beierla, E. W. Bliss Co., introduced the technical speaker, Wilbur S. Walters, Lagrange Shell Molders, Lagrange, Ind. His subject was *"The Foundryman Takes a Look at Shell Molding."*

His discussion of the practical problems of shell molding will be published in the December issue of AMERICAN FOUNDRYMAN.

Central Michigan

RICHARD H. DOBBINS
Albion Malleable Iron Co.

The October meeting was held October 15 in the Hart Hotel in Battle Creek. After dinner, Chairman David W. Boyd, Engineering Castings, Inc., Marshall, opened the meeting by calling for reports from various committees. The reports were highlighted by the announcement that the annual Christmas Party would be held December 5 in the Ballroom of the Hart Hotel.

Technical Chairman Beryl Sprout, Midwest Foundry, Coldwater, introduced the speaker of the evening, T. E. Barlow, Eastern Clay Products Dept., International Minerals & Chemical Corp., Chicago. He related casting defects to deficient sands by listing too high and too low physical properties of sand and showing what casting defects were traceable to these properties.

Twin City Chapter

ROBERT J. MULLIGAN
Archer-Daniels-Midland Co.

Bill Bean, consultant, introduced by Robert C. Wood, Minneapolis Electric Steel Casting Co., as the "Will Rogers of the foundry industry" made a great impression on the 107 foundrymen at the September 16 meeting of the Twin City Chapter. His enthusiasm for the future of the foundry industry fired his audience with new enthusiasm for the industry.

A well designed casting is most compatible with good foundry practice, according to Mr. Bean. To achieve this end, the engineer should think out his design, model it, then discuss it with the foundry superintendent, patternmaker, et al. When all these people are satisfied and the model changed accordingly, then the design can be put on paper.

From a consumers standpoint, Mr. Bean believes that 100 per cent overall quality is not necessary and should not be demanded. It is essential, however, to have highest possible quality where it is needed, i.e., in critical sections of the casting.

H. M. Patton, American Hoist & Derrick Co., St. Paul, introduced to the members Pierre Titeot from France, and Laurens Jobse from Netherlands. They are exchange students currently working at American Hoist & Derrick.

One of the many goals of the Educational Committee this season is the organization of scholarship awards for promising students in this area.

Discussing the evening program for Northern California Chapter's September meeting are (left to right) W. S. Gibbons, Ridge Foundry, San Leandro, Cal.; Harold E. Henderson, H. C. Macaulay Foundry, Berkeley, Cal.; Andrew M. Ondreyco, General Metals Co., Oakland, Cal.; George W. Stewart, East Bay Brass Foundry, Richmond, Cal.; John Bermingham, E. F. Houghton & Co., Lafayette, Cal. The meeting attracted 114 members and guests.

Guest speaker at October meeting of the Philadelphia Chapter was Henry Winte, Florence Pipe Foundry & Machine Co., Florence, N. J. Photo was snapped by Leo Houser, Dodge Steel Co., Philadelphia.

Washington Chapter

HAROLD R. WOLFER
Puget Sound Naval Shipyard

Highlight of the September 19 meeting, held at the Stewart Hotel, Seattle, was the showing of the A.F.S. research film on *"Effect of Gating Design on Casting Quality."* S. C. Massari, the Society's technical director, made the introductory remarks and conducted the discussion after the showing.

Extending the report of the Light Metals Research Committee covered in two previous movies, the latest color-sound film showed how the use of a well at the bottom of a sprue gives minimum dross and air entrapment during pouring. The latest recommendation is the result of the recognition that the restrictions in the runner previously suggested are not effective in all cases.

Diameter of the well, which can be used with either two runners or a single runner leading away from the sprue, should give it an area five times the cross section of the sprue base, while depth below the runner should be equal to the depth of the runner.

Ontario Chapter

P. PROVIAS
Cockshutt Farm Equipment Ltd.

Meeting September 26 at the Royal Connaught Hotel, Hamilton, Ont., the chapter held group meetings for gray iron and malleable, for non-ferrous, and for steel foundrymen. The gray iron and malleable group heard a panel discuss three questions on apprentice training. Panel members were: Andrew Reyburn, Cockshutt Farm Equip., Ltd., Brantford, Ont.; Robert Robertson, International Harvester Co., Stoney Creek,

Ont.; W. A. Bynum, Canadian Foundry Supplies & Equipment, Ltd., Dundas, Ont., and J. M. Hughes, John T. Hepburn, Ltd., Toronto, Ont. Chairman was C. Maddick, Massey-Harris Co., Brantford, Ont.

Asked what qualities make a good foundry supervisor, the panel stressed ability to handle personnel, a prime requisite of all top supervisors. Technical knowledge, a second requisite, was considered important, although the panel pointed out that in large plants the job of top-level supervision becomes coordination of assistants whose technical and practical knowledge are required to be especially thorough.

While opinions on what the exact nature of an apprentice training course should be varied with the type and size of organization and whether the man was to be a mechanic or a supervisor, all agreed the biggest problem was to get young men to enter the industry at apprenticeship wages. One solution proposed was the encouragement of good prospects already in the industry to take educational work.

Mo-Kan Chapter

THOMAS F. SHADWICK
Oil Well Supply Div.
U. S. Steel Co.

Program for the October meeting, staged at the Fairfax Airport, Kansas City, Kan., was a double feature with John A. Rassenfoss, American Steel Foundries, East Chicago, Ind., speaking on hot tears in steel castings, and a motion picture "*The Invisible Shield*" furnished by the Claude B. Schneible Co., Detroit. Chapter Chairman John Redman, Jr., Redman Pattern Works, Kansas City, Mo., presided.

Mr. Rassenfoss explained that pattern design, gating, and pouring temperatures contribute to the occurrence of hot tears in steel castings as do variations in carbon, manganese, silicon, and sulphur content. Hot tears at hot spots can be traced to design and to the mold material used, he said. Thus in making hot tear tests, he stated, it is necessary to keep mold and core materials, and metal composition constant. Hot tears are more likely to occur in thick castings, he declared, and warned that shrinkage cavities cause confusion in determining whether a defect is a hot tear or not.

Hot tear occurrence increases as sulphur content increases, Mr. Rassenfoss said. In describing an experiment with Grade B steel of ½ in. thickness, he said reducing the silicon from 0.55 per cent to 0.35 per cent had no effect.

Rochester Chapter

HERBERT G. STELLWAGEN

Shell mold castings have a higher production cost and a lower finishing cost than commercial green sand castings, G. N. Etherington stated at the October 7 meeting of the Rochester Chapter, Hotel Seneca, Rochester, N. Y. Outlining experiences in the American Brake Shoe Co. plant at Mahwah, N. J., the speaker said that two to 10 lb of green sand are required to produce each pound of gray iron, while by shell molding two to eight pounds of castings are produced with a pound of sand. However, he warned, resins are costly and must be handled with care.

Shell molding can be done in a large, expensive manner or can be carried on with simple, inexpensive, home-made equipment. Advantages cited by Mr. Etherington, who said shell molding has progressed rapidly since it got started in this country in 1947, are: skilled help not required; produces castings with good surfaces and dimensional accuracy of plus or minus 0.005 in.; molds can be stored readily; and cleaning cost is low.

Disadvantages of shell molding given by Mr. Etherington are: high initial pattern costs; casting costs prohibit small runs; gating and risering poses new problems; resin is costly; size of castings is limited, 200 lb being the heaviest known poured; and available production equipment is limited.

Northeastern Ohio

JACK C. MISKE
Foundry

Some 325 members and guests attended the October 9 meeting at the Tudor Arms Hotel, Cleveland. Preceding the technical talk by John A. Mescher, Unitcast Corp., Toledo, Ohio, the Claude B. Schneible Co. (Detroit) film entitled "*The Invisible Shield*" was shown. Illustrated were ways in which foundries can avoid air pollution in their own shops and in the communities in which they operate.

Mr. Mescher discussed different types of core blowing machines, pointing out their advantages and disadvantages. Advantages cited included fast, cheap operation and uniform core quality. Core blowers can do jobs that can't be done by hand ramming, he said, pointing out that an entire core can be blown at once without parting lines and will not require patching. Secrets of successful core blowing, said Mr. Mescher, include cleanliness of equipment and provision of adequate vents and blowholes.

Tri-State Chapter

FRED E. FOGG
Acme Foundry & Machine Co.

John A. Rassenfoss, American Steel Foundries, East Chicago, Ind., spoke on hot tears in steel castings at the October 17 meeting at Wilders Cafe, Joplin, Mo. He discussed the chemistry of steel and its relationship to hot tears. He pointed out the importance of casting design, hindered contraction, and the influence of the manganese-sulphur ratio in producing hot tears. Even distribution of heat, control of sand, and high quality of scrap are effective in reducing hot tears according to the speaker. A general discussion on the subjects presented followed the program.

Seated at speaker's table during the October meeting of the Saginaw Valley Chapter are (left to right) Guest Speaker S. C. Massari, A.F.S. Technical Director, Chapter Chairman Kenneth H. Priestly, Vassar Electroloy, Vassar, Mich., and Vice Chairman F. James McDonald Central Foundry Division of General Motors Corp., Saginaw, Mich.

Panel on "Problem Castings" for the Southern California Chapter's October meeting included (left to right) B. M. Campbell, Dayton Foundry, Hollydale, Cal., H. W. Howell, Howell Foundry Co., Los Nietos, Cal., Robt. Gregg, Reliance Regulator Div., American Meter Mfg. Co., Alhambra, Cal., and J. E. Eppley, Axelson Mfg. Co., Los Angeles.

abstracts

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Industrial noise

A239 . . "Noise in Industry," Carey P. McCord, M.D., *Advanced Management*, Vol. 27, No. 6, June 1952, pp. 11-13

Noise threatens to impose new difficulties on industry, according to Dr. McCord. Noise provokes excessive fatigue, impairment of flow of digestive fluids, increases in pressure of spinal fluids. Measurable loss of hearing can result from high intensity noises. No agreement has yet been reached on the noise level at which impairment of hearing begins. Mere loudness is not the only factor, since frequency must also be considered.

Old machinery is a prime source of noise in industry and maintenance is an important factor in noise abatement. In addition isolation, acoustical treatment of structures, and use of ear plugs reduce noise. Guidance of compensation boards by the best medical minds is recommended to assure fairness in settling early claims which will set a pattern for future decisions.

Testing cast iron

A240 . . "Present State of German Testing of Cast Iron," A. Wittmoser and W. Seeliger, *Giesserei*, Vol. 39, No. 19, September 18, 1952, pp. 477-483. (In German)

The authors discuss the various testing procedures as applied in Germany, covering metallurgical tests, physical tests, mechanical tests (static and dynamic), etc. The merits and demerits of each method are pointed out not only from the technical standpoint but the economic as well. Corrosion behavior, wearability, volume constancy, refractoriness, machinability, and electric, thermal and magnetic properties are related.

Weld castings to plate

A241 . . "Fabricated Castings and Plate Make Lighter Pumps," R. Zeh, *Iron Age*, Vol. 170, No. 9, August 28, 1952, pp. 100-101.

Oilfield pumps had approached the weight limit of portability, so when a new, higher capacity unit had to be designed no more weight could be tolerated. A solution was found by replacing heavy castings with combined lighter castings and plate welded together. This reduced the weight of the unit 4000 lb.

Cleaning investments castings

A242 . . "Precision Investment Castings—Cleaning in Molten Caustic Soda," N. L. Evans, *Iron and Steel*, Vol. 25, No. 10, September 1952, pp. 396-397.

A problem encountered in the production of precision investment castings is the complete removal of the investment material from the metal. It is possible to do this quite satisfactorily if all gross deposits of refractory material are first removed by hand and the casting is then dipped into a pot of molten caustic soda. If descaling is also necessary, it may be accomplished in a second bath of caustic soda to which a small amount of sodium hydride is added.

Cement sand molding

A243 . . "New Observations in the Cement Sand Molding Processes," M. von Beilhack, *Giesserei*, Vol. 39, No. 17, August 21, 1952, pp. 405-409. (In German)

The permeability to gas and final compressive strength of two different cements used under various cement/water ratios are analyzed in detail. Iron portland cement showed a definite inferiority to portland cement. However the final strength of iron portland cement was found to be sufficient to merit its use for cement sand molding and core processes.

Sulphur in slag

A244 . . "A Stoichiometric Combustion Method for the Determination of Sulphur in Slags," C. J. B. Fincham and F. D. Richardson, *Journal of the Iron and Steel Institute*, Vol. 172, No. 1, September 1952, pp. 53-55.

A method for the stoichiometric determination of sulphur in slags is described. The SO_2 produced by melting the slag in a stream of carbon dioxide is measured. The analysis time is 30 minutes for both open-hearth and blast-furnace slags and the accuracy claimed is plus or minus 2 per cent.

Economy of castings

A245 . . "Cast Crankshafts and Camshafts," H. Jungbluth, *Gjuteriet*, Vol. 42, No. 8, August 1952, pp. 123-129. (In Swedish)

Casting is the most economical method of manufacturing complicated crankshafts with cranks in varying angles. The weight of the casting before machining is less than that of a rough forging. Composition as well as structure of the various types of crankshafts are analyzed in detail. Cast iron features the following advantages over cast steel: a smaller notch fatigue factor, a greater damping capacity, and better bearing properties. The various methods of molding are treated. Camshafts are also nearly always cast. The ways and means of obtaining hardened cams are described.

Rare earths in steel

A246 . . "Properties of Cast Steels Improved with Rare Earth Elements," G. A. Lillieqvist and C. G. Mickelson, *Journal of Metals*, Vol. 4, No. 10, October 1952, pp. 1024-1031.

Rare-earth additions to melts of cast steels were found to improve their ductility, impact strength, inclusions, hot tears, fluidity, sulphur reduction,

Members of A.F.S. Board of Awards in preliminary meeting at Minneapolis home of Past President S. V. Wood, Minneapolis Electric Steel Casting Co., September 30. Left to right, rear: Mr. Wood; Past Presidents Walter L. Seelbach, Superior Foundry Co., Inc., Cleveland; W. B. Wallis, Pittsburgh Lectromelt Furnace Corp.; Max Kuniansky, Lynchburg Foundry Co., Lynchburg, Va.; and Fred J. Walls, International Nickel Co., Detroit. Front: A.F.S. Sec-Treas. Wm. W. Maloney and Past President E. W. Horlebein, Gibson & Kirk Co., Baltimore, Md.

porosity, weldability, and feedability. The addition, a trade product, was found most probable that the use of rarenum addition was made. Conclusive tests were carried out on all of the above effects and the results make it most probable that the use of rare-earths will increase in the near future.

Coke/carbon dioxide reaction

A247 . . "Carbon Monoxide Formation During the Passing of Carbon Dioxide Over Incandescent Coke at Changing Temperatures and Velocities of Flow," G. Clas, *Giesserei*, Vol. 39, No. 19, September 18, 1952, pp. 473-477 (In German)

Carbon oxide reduction increases with rising temperatures for all velocities of flow, but diminishes slightly unequal temperatures (with exceptions). The reduction is ended in the cupola furnace at the second and third coke charge. The different varieties of coke show very few differences as regards the reduction.

Electric furnace iron

A248 . . "Use of the Electric Furnace in the Iron Foundry," A. Tenivella, *Fonderia*, No. 7-8, July-August 1952, pp. 287-291. (In Italian)

The author discusses the economic and other aspects of electric furnaces. He compares the costs and ease of their operation with those of other types of furnaces. Problems of desulphurization, dephosphorization, and deoxidization are treated. According to the author, the chemical and mechanical qualities of the material treated by the furnaces are such as to render the use of the electric furnace conducive to higher homogeneity, endurance, and applicability. Experiments have in most instances demonstrated superiority of this method over others.

Shell molding

A249 . . "The Croning Shell Mold Process — A New German Molding Process," F. Polguter, *Giesserei*, Vol. 39, No. 19, September 18, 1952, pp. 467-472. (In German)

This article is devoted to a discussion of the development, stages and general nature of the Croning shell mold technique. Instead of using solid molds and cores, shells are used. Croning followed closely the principles developed in the Schlicker process, common in the field of ceramics. For molding material fine and dry argentiferous sand is used. This sand must, if possible, be free from organic ingredients, clays, and metallic oxides. As binding medium a phenol-cresol-formaldehyde resin is used, along with the hardening agent hexamethylenetetramine. The author discusses in considerable detail the applicability of the technique to the various metals and the making of mold and core machines. Considerable attention is paid to the economics of the process. Advantages are discussed in considerable detail.

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Grinding Wheel Co., Detroit. Dr. Kistler resigned recently as director of research for Norton Co. to accept the deanship of the University of Utah College of Engineering.

E. R. Koester, formerly manager of manufacturing of the GE Small Appliance Div., Bridgeport, Conn., is now manufacturing manager for the X-ray department and **Martin A. Edwards,** formerly engineering manager of GE's general engineering laboratory in Schenectady, becomes engineering manager for the department.

John C. Soet, acting director of the Industrial Health Div., Michigan Department of Health, tells on page 43 how

John C. Soet . . . . . cites fume hazards

lead fume hazards were eliminated in a bearing foundry. He served both industry and municipalities as an engineer before joining the department in 1939. A frequent contributor to the literature and participant in health conferences, Mr. Soet has degrees from the University of Michigan and Columbia University.

Roy W. Schroeder discusses merits and demerits of entries in the 1952 A.F.S. Apprentice Contest on page 60 as he has for the past several years since becoming chairman of the Apprentice Contest Committee. Now assistant professor at the University of Illinois (Chicago undergraduate branch), he entered the foundry industry as an apprentice molder in 1915. Since then he has worked in a number of foundries, finally going into Education.

Douglas C. Williams, associate professor of industrial engineering in charge of foundry practice at Ohio State University, revives some sand research data in his story suggesting a relationship between hot tears and certain high temperature properties of sand on page 47.

continued on page 96

The data were collected while Prof. Williams was A.F.S. research fellow at Cornell University where he received his Ph.D. A graduate of Beloit College (1930), he worked for American Steel Foundries, East Chicago, Ind., after holding various positions with other companies.

William A. Morley, foundry manager of the Olney Foundry Div., Link-Belt Co., Philadelphia, has a more analytical approach to foundry mechanization in his article on page 53 than many authors do. His outline of how to decide where and how to mechanize has been presented before A.F.S. Chapters and before the 1951 International Foundry Congress in Brussels. Mr. Morley's foundry career started with Link-Belt in 1929 when he became a patternmaker at the Chicago plant. He subsequently served an apprenticeship as a molder, becoming assistant superintendent in 1942. He went to the Philadelphia plant in 1944 to assume his present post.

William A. Morley . . . . . mechanization

Carl R. Sare, formerly assistant to the president of Patterson Foundry & Machine Co., East Liverpool, Ohio, has been elected vice-president of W. W. Sly Manufacturing Co., Cleveland. He will be primarily concerned with promoting dust filter sales.

Sherwood B. Seeley has been promoted to technical director of Joseph Dixon Crucible Co., Jersey City, N. J. Mr. Seeley, for the past eight years director of research, will exercise direct control of the laboratories, research, development and engineering activities of the company.

R. R. Huntington has assumed the duties of sales engineer in Louisiana, Mississippi and Eastern Texas for Joseph Dixon Crucible Co., Jersey City, N. J. Mr. Huntington will work in close association with **E. M. Brooks,** who has been the Dixon Company's representative in that territory for many years. Mr. Huntington will bring to his new field of activities a background covering more than 15 years of industrial-supply experience.

obituaries

Professor Rueben S. Tour, 63, industrial consultant, and head of the University of Cincinnati's Department of Chemical Engineering, died August 1. Under his leadership his department was one of the first in the country to be accredited by the American Institute of Chemical Engineers. Among his survivors is his brother Sam Tour, Sam Tour & Co., Inc., New York.

Thomas G. Johnston, metallurgical engineer for Republic Steel Corp., Cleveland, died of a heart attack while en route home from a business trip to Chicago. He was associated with United States Pipe & Foundry Co., Bessemer, Ala., for many years before joining Republic at Cleveland.

Royston T. Covington, 57, died September 4 after a prolonged illness. Mr. Covington was active in the foundry industry until the fall of 1945, when he left the superintendency of American Hammered Piston Ring Div. of Koppers Co. to form and operate the Covington Motor Co., Bethesda, Md. He was instrumental in the formation of the Chesapeake Chapter of A.F.S. and served as third chairman during 1943-44 term.

Hugh J. Fraser, vice-president in general charge of all plant operations in the United States for International Nickel Company, New York, died August 22 after a brief illness. Mr. Fraser joined International Nickel's Huntington (W. Va.) works in 1923, serving in various technical and operating capacities before going to the New York office as assistant manager of the production department. He was elected vice-president in 1947 and shortly thereafter was placed in general charge of all International Nickel plant operations in the United States.

Charles Jarecki, 83, former vice-president and director of Jarecki Manufacturing Co., Erie, Pa., died suddenly October 18. In addition to his position at the Jarecki plant, he was a past secretary and director of Continental Rubber Works. The Jareckis were among the charter members of A.F.A. when the society was formed in Philadelphia in 1896. Mr. Jarecki was also active in developing the Northwestern Pennsylvania chapter and was one of its charter members.

Dr. Walter G. McGuire, chairman of the board, Independent Pneumatic Tool Co., Aurora, Ill., died of a heart attack, August 11, in Chicago's Mercy hospital where he was a member of the staff.

William Greene Pearce, former president and board chairman of American Brake Shoe, died a short time ago at the age of 93. He came to New York as vice-

president of Brake Shoe in 1910. Directors of American Brake Shoe in recording the death of Mr. Pearce said, "In his responsibilities his mind was concentrated on the cause to the exclusion of himself, to a degree none of us had ever witnessed and probably never will again."

Edward B. Sherwin, president of Chicago Hardware Foundry Co., North Chicago, Ill., died of a stroke suffered while riding home in his automobile from a meeting of the directors of Illinois Manufacturers Assn. Mr. Sherwin who was also a director of McCarthy Foundry Co., entered the employ of Chicago Hardware shortly after graduation from Armour Tech. and worked his way up. He was nationally prominent in the foundry industry, was a past president of the Gray Iron Founders Society, and a past director of National Founders' Association and had recently been re-elected treasurer.

Edward B. Sherwin

Frank Cordes, 82, retired Pittsburgh industrialist and former chairman and president of Blaw-Knox Co., Blawnox, Pa., died October 20 at his home.

Fred Haggerson, chairman of the board of Union Carbide & Carbon Corp., New York, died October 14 after a short illness. He had been with the corporation more than 33 years.

Frederick L. Curtis, 84, retired vice-president of Raybestos-Manhattan, Inc., Passaic, N. J., and former general manager of the Manhattan Rubber div., died September 20 at his home in Passaic, N. Y. William H. Dunn, retired Raybestos-Manhattan treasurer, died September 29 at his South Orange, N. J. home.

Allan Philip Harrisson, general purchasing agent for Robert Mitchell Co., Ltd., Montreal, Que., Can., died suddenly October 11.

Herman R. Johnson, president of Universal Drop Forge Foundry, Sandwich, died recently of poliomyelitis. He was stricken while on a fishing trip at Kenora, Ont., Can.

American Foundrymen's Society

introduces

New Company Members

Alloyed Graíron Castings Corp., Ravenna, Mich.—C. J. Lonnee, Pres. & Gen. Mgr. (Western Michigan Chapter) Conversion from Personal
Bakelite Co., Div. of Union Carbide & Carbon Corp., New York, N. Y.—Edward H. Gross, Div. Mgr. (Metropolitan Chapter).
Belcher Malleable Iron Co., Easton, Mass.—F. C. Tuttle, Pres., (Non-Chapter).
Canada Iron Foundries, Ltd., Three Rivers, Que., Canada—G. B. Perrot (Eastern Canada Chapter)—Conversion from Personal Affiliate
Federated Metals Canada, Ltd., Montreal, Que., Canada—Gerald F. Norman, Sls. Mgr. (Eastern Canada Chapter).
Marshall Supply & Equipment Co., Tulsa, Okla.—Philip W. Clemmons, Salesman (Tri State Chapter).
Lake City Malleable, Inc., Ashtabula, Ohio—Walter Howard (Northeastern Ohio Chapter).

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Central Michigan Chapter

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Richard H. Lambrecht, Pres., *Albion Pattern Co.*

Central New York Chapter

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Robert D. Rommelt, Mgr., *R & E Pattern Works & Foundry*

Andrew E. Peterson, Oliver Corp., South Bend, Chairman of Michiana Chapter which shows greatest current membership gain.

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R. C. Bopes, General Fmn., *Studebaker Corp.*
E. Bradley, General Fmn., *Studebaker Corp.*
E. J. Buttens, General Fmn., *Studebaker Corp.*

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South Australia

Andrew Edwin Smith, Works Dir., Horwood Bagshaw, Ltd., Adelaide, South Australia

basic refractories

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brick in a basic furnace where the angle of repose is not too great.

Higher porosity materials, in general, exhibit a greater area for slag attack and flux more rapidly than do materials of lower porosity of nearly identical chemical analysis. Two chemically similar refractories will show different abilities to withstand quick temperature changes; the sample with the higher porosity generally being superior in this respect.

The cost of basic refractories is comparatively higher than the cost of commercial acid refractories in the same form. Cost variations among basic refractories themselves are great.

Ease of application of a refractory may mean the difference between its success or failure in a particular job. Important considerations include the facility with which the refractory mixes with water, its ability to slide off a shovel smoothly, whether a brick mason can trowel it, and the ease of installation. It is unprofitable to shut a furnace or cupola down for installation of new brickwork when a workman can make repairs with a gun refractory—shooting or even shoveling the material in place.

Probably of equal importance with the attainment of desirable physical and chemical properties is the uniformity of these properties which the manufacturer can maintain. The appearance of a refractory—cracks, color markings, dimensional uniformity—often is judged more important than it really is. Most basic refractories are subjected to extremely high temperatures during their manufacture, and such manufacturing techniques frequently result in some noticeable irregularities in appearance which have little to do with ultimate serviceability.

Most producers of basic refractories provide experienced service personnel to help the user in selecting his refractories and to make suggestions for their proper installation, maintenance and use. Their advice can be especially helpful since foundry uses of basic refractories are comparatively new and not extensively recorded. This article has been written in the hope that it will serve as a general guide for the operators of shops which are starting out on basic operations where previously only acid processes were employed.

Further information may be gained by study of the references listed:

1. H. C. Lee "Refractories from Ohio Dolomite," Ohio State University Engineering Experiment Station News, Vol. XIX, No. 2, April, 1947.
2. J. M. Camp and C. B. Francis *The Making, Shaping and Treating of Steel*, United States Steel Co., Sixth Edition, June 1951.
3. *Modern Refractory Practice*, Harbison-Walker Refractories Co., Third Edition, 1950.
4. H. C. Bigge, "Bottom Building and Maintenance," *Proceedings of Electric Furnace Steel Conference*, 1950, page 66 and discussion page 69.
5. Alexander L. Field "Experience with Chromite Hearths," *Proceedings of Electric Furnace Steel Conference*, 1944, discussion page 81.
7. R. Birch and O. M. Wicken, "Magnesite and Related Minerals," "Industrial Minerals and Rocks," 1949 Seely W. Mudd Series American Institute of Mining and Metallurgical Engineers.
8. "The Development of Monolithic Dolomite Linings," The (British) Iron & Steel Institute, 1941.
9. J. S. McDowell and J. D. Custer, "Fundamentals of Foundry Refractories," Harbison-Walker Refractories Co., Pittsburgh.

Letters to the editor

All letters of broad interest which do not violate A.F.S. policy or good taste are publishable. Write to Editor, American Foundryman, 616 S. Michigan Ave., Chicago 5, Ill. Letters must be signed but will be published anonymously on request.

Anyone may subscribe

While waiting in the office of one of our clients I read with interest your September issue of AMERICAN FOUNDRYMAN. Is it possible to subscribe to this magazine without being a member of the American Foundrymen's Society? If so, please start my subscription with the September issue.

J. E. MOORE, *V. P., Engineering*
Corporate Service, Inc.
Detroit

Many AMERICAN FOUNDRYMAN *subscribers are not members of A.F.S. A number of non-member subscribers join, however, after recognizing the valuable contacts they can make through meetings and the advantages of the member price on the Society's more than 50 publications in the field of foundry operations and technology.*

Bouquets for education story

Recently I read Hiram Brown's article entitled "*Are Technical Graduates Getting Adequate Training in College?*" (AMERICAN FOUNDRYMAN, September, page 56). I heartily agree with his experience and wish something could be done about it.

CHARLES S. DU MONT
Battelle Memorial Institute
Columbus, Ohio

Have just read Hiram Brown's article on training shortcomings of college graduates. Please rush 500 reprints.

D. C. WILLIAMS, *Assoc. Prof.*
Industrial Engineering Dept.
Ohio State University

Hiram Brown's article is extremely challenging and makes implications with which I earnestly agree. He has done education a real service and I hope the article will be reprinted in as popular a magazine as *Reader's Digest* for the general benefit of everyone.

A logical sequel to the article would be an outline of a curriculum that expresses technical preparation in general terms but which would specify more completely—with as many alternate courses as possible—the general educational aspect of a training program for engineers.

A second sequel would be a discussion of the methodology of teaching the general educational aspects of the suggested curriculum.

If it is agreed that learning is the having of experience (actual or vicarious) with some evaluation . . . that education is the development of attitudes whereas training is the development of aptitudes . . . perhaps what is most needed among technical educators is a concrete suggestion which gets them out of the clouds and gives them something to work on.

I have been impressed with the feeling that many educators do not see from their cloistered position the real inner workings of the man who is the product of their institutions. They see him in terms of success as defined by Brown but they don't see the man in the process of approaching or receding from the criteria he sets forth. In short, they do not understand people in their whole unitary selves but they see people only from certain artificial standards. In this the technical educator is no dif-

ferent than the educator in the general curriculum.

HIRAM E. HUNN, *Attorney*
Des Moines, Iowa

Brickbats for book

On receiving the September issue of AMERICAN FOUNDRYMAN I noted on page 43 the write-up and praise for Edwin W. Doe's book *Foundry Work*. I believe I was among the first to purchase a copy and I did enjoy reading same with reservations. It is educative and also interesting and does deserve credit and some of the plaudits lavished upon its publication for it certainly does fill in a need.

However, a few brickbats may also not be amiss.

As a patternmaker of 48 years working, I would draw attention to page 9 item 11—to quote "a drawnail or drawspike is a sharpened piece of metal driven into the pattern . . . for removing the pattern from the mold." Again on page 19 item 9—"Drive a sharpened drawspike." Also page 23 item 9, page 24 item 6, page 26 item 7, and page 27 item 10—"Drive a sharpened drawnail." OUCH!

Oh, oh, did the poor benighted heathen (words from Kipling's "Fuzzy Wuzzy") never hear of or been informed of draw plates and screwed draw irons, their use being to extract or draw the patterns from molds. Draw and rapping plates can be made with the aid of even a breast drill and a tap operated by hand.

Now if any of the molders were to drive a sharpened nail or sharpened draw iron into one of my patterns, boy O boy, would I hit the ceiling. I have too much respect for patterns to mutilate them with sharpened spikes or irons. Even for a pattern made for only one off, I place on the rapping and draw plates which greatly helps the molders. And when the pattern is discarded, I salvage the plates for future use.

Also page 13 on split patterns. Wood pins are really taboo. Use screwed in master dowels of metal. They are easily salvaged and are by far and away more accurate in use than wood pins. I myself have been using metal dowels and rapping and draw plates since 1925 and this is 1952! Yes, served my apprenticeship as a patternmaker in Scotland. Bah! Sharpened nails—sharpened draw irons! Bah!

For heavy and large patterns I place and rout in long draw straps down the sides of the patterns which are a great aid in their removal from molds. Well, so much for the sharpened nails and sharpened draw irons.

Incidentally, on page 14, Fig. 7, where, O where, are the other or male ½ of these hinges or maybe I am wrong on that one!

Page 46, Fig. 53—What? metal is he pouring (teeming). Even with Mg or Al it would take an Atlas or a Titan to hold that ladle and lift and pour with only ½ a shank and where is the protection—leggings and goggles. Further to this is the portrayal in some of the illustrations the nonchalant handling of tapped metals without protective clothing. Granted in the notes safety first is well emphasized, but pictures often talk.

These are a few brickbats to lend color and to show that one volume has been received, read, and studied. No hard feelings. I hope, Mr. Doe, they will aid in the preparation of future printings of the book.

WM. DEANS, Patternmaker
Powell River Co., Ltd.
Powell River, B.C., Canada

Shop kinks from Italy

Overseas with the consulting foundry team sent to Italy by the Mutual Security Agency, I had an opportunity to learn about some of their problems and to appreciate the good work Italian foundrymen are doing, often with poor (by American standards) facilities and supplies. The two ideas below illustrate their ingenuity.

In one foundry all pit work was cast in pits with sloping walls like an inverted pyramid without a peak. Cores to be assembled in the pits had the same slope on their outside surfaces. Thus, when a mold was assembled, the cores just seemed to drop into place and the slope forced them together. Runouts and mold wall movement were eliminated.

Another foundry had developed an excellent time saver. For their floor jobs requiring metal flasks, they have a number of loose bars which are stepped at each end to enable them to lay on the edge of the cope. Instead of bolting each bar individually, they lay a tie bar across the ends of the flask bars. Each tie bar has two or three holes corresponding to holes in the flange of the cope. When bolted, the tie bars hold down the flask bars. In addition to flexibility, this arrangement saves time in fastening bars.

A. W. PARIS, *Consultant*
Aurora, Ill.

foundry **tradenews**

Reynolds Metals Co., Louisville, Ky., has increased the capacity of its plant at Longview, Wash., from 60 million to 100 million lb of pig aluminum per year. This was accomplished, while maintaining aluminum production, by enlarging the installation's 372 reduction "pots"—electrolytic cells where alumina becomes metallic aluminum.

Claud S. Gordon Co., opened a manufacturing plant on a 6½ acre site at Richmond, Ill. Modern, new machinery has been installed for the manufacture of thermocouples, pyrometer accessories, speciality instruments, and metallurgical testing machines. The new facilities also include a modern, complete wire insulating mill.

Electric Furnace Co., Salem, Ohio, has incorporated a subsidiary Canadian company with headquarters in Toronto to be called Canafco Ltd. The new Canadian company will design, erect, and put into operation both fuel fired and electrically heated industrial heat treating furnaces, special atmosphere generators, charging machines, and other auxiliary equipment in collaboration with the parent company.

National Lead Co., New York, recently formed a division to take over the manufacturing operations of **Pioneer Alloy Products Company, Inc.,** Cleveland, one of the first producers of stainless steel castings in the country. Manufacturing operations of the new division will be located in Ellwood City, Pa. Production will consist of corrosion-resisting valves, heat-resisting and acid-resisting castings, and chrome-nickel-steel valves.

Hyster Co., Portland, Ore., transferred its Eastern industrial truck sales and service departments to Danville from Peoria, Ill. The new sales offices are housed in a modern newly-completed office building adjacent to the manufacturing plant.

Admiral Die Cast Corp., Chicago, is building an addition to its plant of approximately 18,000 sq ft of floor area.

Ohio Tramrail Div., Forker Corp., Cleveland, recently appointed Barton Sales Co., Ft. Wayne, Ind., Hugh Boyd, Mansfield, Ohio and Tedd Harris Co., N. Tonawanda, N. Y., representatives of Ohio Tramrail in the Great Lakes area.

Independent Pneumatic Tool Co., Aurora, Ill., announced that its house organ *Thor Scoreboard* has attained a nation-wide circulation of 100,000 copies per issue. The paper typifies a new industrial press which many major manufacturers are using to reach their employees and customers.

Mechanite Metal Corp., New Rochelle, N. Y., has concluded an agreement with **Crofts Engineers Ltd.,** Yorkshire, England, for exclusive right in the United States, Canada, Mexico, South America, and other countries for use of their new process for melting metal borings in a cupola. This process and device for using metal borings operates with negligible metal loss and completely eliminates the briquetting process.

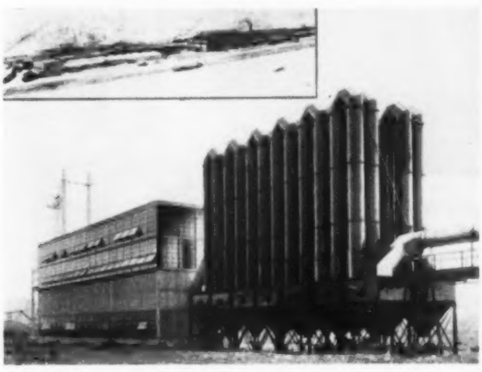
Lindberg Engineering Co. has purchased 4½ acres adjoining the Southern Pacific Railroad tracks in Los Angeles. The company plans building a plant and offices for the manufacture of its line of melting furnaces.

Michigan Oven Co., Detroit, has appointed A. N. Mason and John Kenneth Gillett sales representatives in Metropolitan New York and northern New Jersey. They will also represent Eclipse Fuel and Engineering Co.

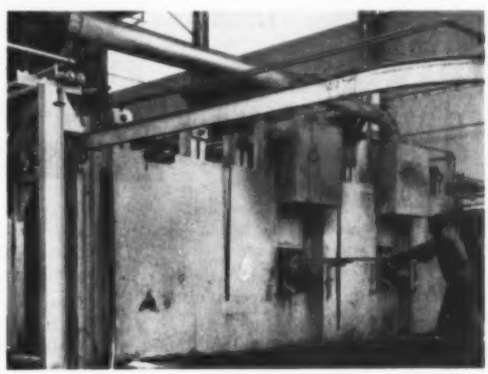
Lebanon Steel Foundry, Lebanon, Pa. received a letter of citation from the Philadelphia Ordnance Dist. for the production of castings for military tanks and for developments which have resulted in "substantial savings to our government." The citation was based in part on the fact that Lebanon has produced castings having a low rejection rate.

DeBothezat Fans Div. of American Machine and Metals, Inc., East Moline, Ill., announces the appointment of Air, Dust and Fume Control Co., New York, as their new representative for greater New York and northern New Jersey.

Griffin Wheel Co., a subsidiary of American Steel Foundries, Chicago, plan construction of a railroad wheel foundry at St. Hyacinthe, Que. The new company will be known as **Griffin Steel Foundries, Ltd.** Expected to begin operations in the summer of 1953, the



Addition of an installation for handling reclaimed zinc oxide continues R. Lavin & Sons' (Chicago) program of modernization. Primary function of the bag house is to conserve zinc fumes in the form of oxide, which can be used extensively in industry. Waste of valuable metals are thus eliminated and atmospheric conditions in the community improved. Artist's sketch (upper left) shows entire plant.



H. Kramer & Co., Chicago, held the formal opening in El Segundo, Calif., Oct. 14, of their modernly equipped brass and bronze ingot smelting plant. The plant, located on 23 acres of ground, includes modern offices and laboratory. Two 60-ton reverberatory furnaces (shown above), have been built so that all loading of raw material will be done through the top of the installations.

New steel foundry will produce the newly-designed X-3 wheel for freight cars. Initial production will be 180 freight car wheels a day, and will be doubled shortly thereafter. The X-3 wheel was developed by Griffin and especially designed for heavy and severe freight service. It is made of low carbon steel, forced by pressure into graphite molds. After removal from the molds, wheels are heat treated to remove all internal stresses. All operations are automatically controlled for both time and temperature. Up to the present, steel freight car wheels have been imported. The manufacture of the X-3 in Canada is expected to result in material savings.

Wheelco Instruments Div., Barber-Colman Co., Rockford, Ill., has appointed the following men district managers in their areas. Robert P. Campbell, Grand Rapids, Mich.; Edmund C. McFaul, Cincinnati; Earl J. Kelley, Clarksburg, W. Va.; J. McKeown will head a sub-office in Clarksburg.

Anthes-Imperial Co., Ltd., St. Catharines, Ont., and Winnipeg, Man., have acquired financial control of the **Great North Foundry Ltd.** of Edmonton, Alberta. Operation of the plant will be fully integrated with the manufacturing divisions of the parent company to serve the needs of customers in the expanding economy of Western Canada. The Great North Foundry is now under the management of E. J. Argue who has been appointed works manager. He was formerly sales manager of the western division of Anthes-Imperial.

Great Northern Carbon and Chemical Co. (a recently formed Montreal sales organization), have been appointed exclusive agents in Canada for several divisions of Great Lakes Carbon Corp., Niagara Falls, N. Y. The new organization will distribute Great Lakes carbon and graphite electrodes, anodes, graphite mold stock, miscellaneous powders, heat exchangers, and raw and calcined coke. Specialty among the products will be graphite electrodes.

Archer-Daniels-Midland Co., Minneapolis, recently celebrated their golden anniversary. In those 50 years a small linseed oil mill has become one of the largest processors of agricultural crops, and today manufacturers more than 700 standard products. ADM pioneered the use of scientific research to alter the basic chemical structure of linseed oil.

Rotor Tool Co., Cleveland, have formally opened their new plant. It is located on six acres which go back to NYC tracks, and entire plant and offices are housed on one floor. An outstanding feature of plant and offices is the winter-summer air-conditioning system which maintains an inside temperature average of 75 F at all times.
continued on page 111

▶ ***Rammed up and poured***

Bill Walkins, the foundryman's bard.

Fall guys

Now, this plant works both night and
day and it's a dirty shame
For any trouble on the way
The night man gets the blame . . .

When we get up and the birds don't
sing
The night men done it!

If we go to work and the clock won't
ring
The night men done it!

If the oven smokes, if the cores are
green,
If there's something wrong with the
molding machine,
If a link core blows or a mold ain't
clean,
The night men done it!

If we find a mold with the heads
caved in,
The night men done it!

If that rammer's acting up again,
The night men done it!

If a pattern is rough, if the sand's
too dry,
If the sand mill's down and we don't
know why,
If we have to work on the Fourth
of July,
The night men done it!

Do you know who picked my toolbox
lock?
The night men done it!

Who broke the glass on the front of
the clock?
The night men done it!

At home, my radio's out of tune,
There are spots on the wall of my
living room,
There'll be a new baby up at my
house soon—
But who am I to jump at conclusions?

From the book *Rammed Up and Poured*, by Bill Walkins, copyrighted by the Electric Steel Foundry Co.

news of technical committees

Mulling sub-committee

The first meeting of the Sub-Committee on Mulling Techniques of the Green Sand Properties Committee was held September 3, at Griffin Wheel Co., Chicago. Karl J. Jacobson of Griffin Wheel, chairman of the sub-committee, presided. First order of business was election of a vice-chairman and the group unanimously selected George P. Pusey, International Harvester Co., Milwaukee.

After discussion of its objectives, the committee decided to limit its studies to the preparation of green molding sands. Its objectives are to be three-fold: (1) to determine and define the theory of molding sand preparation. In particular, to determine and state the purpose of mulling green sands and what results should be expected from a given sand prepared in a standard manner with a given type of equipment; (2) to establish, define, and describe a standard mulling technique for a particular type of equipment; (3) to establish the proper adjustment, maintenance, and operation of a particular type of sand preparation equipment.

Work of the committee started immediately using sand supplied by American Colloid Co., Chicago. In the initial work of the committee, laboratory mullers of three types are being used. Batches of green molding sand containing 4 per cent bentonite and 2 per cent moisture will be mulled for various times. Samples for green compression strength will be taken and tested periodically until data indicate that a maximum and possibly constant strength has been attained. Date for completion of the work has been set at December 1, 1952.

In addition to Committee Chairman Jacobson, the following participated in the Mulling Techniques Sub-Committee meeting: Clyde A. Sanders, American Colloid Co., Chicago, chairman of the Sand Division; Mr. Pusey; William M. Ball, III, Hill & Griffith Co., Cincinnati; Roy W. Bennet, Walter Gerlinger, Inc., Milwaukee; M. H. Horton, Deere & Co., Moline, Ill.; H. G. Schlichter, Beardsley-Piper Div., Pettibone Mulliken Corp., Chicago; Eric Welander, John Deere Malleable Iron Works, East Moline, Ill.; Clifford F. Wenninger, National Engineering Co., Chicago; and S. C. Massari, Technical Director, American Foundrymen's Society.

Educational division

Plans for the A.F.S. Convention scheduled to meet in Chicago May 4 to 8, were discussed by the Executive Committee of the Educational Division at a meeting in the Sherman Hotel, Chicago, October 15.

At the request of Prof. G. J. Barker, University of Wisconsin, chairman, several suggestions were offered: an Educational Dinner, at which Harry Gravlin, Ford Motor Co., Dearborn, Mich., would present a chapter educational program; and two sessions, during each of which technical papers would be presented.

For the first session, B. D. Claffey, Acme Aluminum Alloys, Inc., Dayton, Ohio, would be asked to discuss what he thinks is lacking in the education of men for the foundry industry. F. G. Sefing, International Nickel Co., New York, N. Y., agreed to prepare a paper suggesting remedies for such defects.

The second session would feature two or three representatives of management who have set up successful in-plant training programs.

Prof. Richard W. Heine, University of Wisconsin, reporting on the recruiting of engineers, stated that the University of Wisconsin intends to survey its graduates to learn what progress they have made in the foundry industry since graduation. After the results of this survey have become known, the Education Division will decide whether such a survey should be extended in cooperation with the Foundry Educational Foundation.

It was reported that four chapters of the College Textbook have been completed by R. W. Heine and P. C. Rosenthal, University of Wisconsin, and are being reviewed by the Textbook Committee. The complete manuscript probably will be available shortly after the first of the year, it was noted.

Plans for choosing an author to prepare a text on the apprentice level also were discussed.

Mr. Sefing reported that Committee 4-N (Guide to A.F.S. Chapters on Educational Activities) will prepare an outline of educational activities which any chapter can undertake.

Present at the meeting were G. J. Barker, chairman, G. K. Dreher, Foundry Educational Foundation, Cleveland, Ohio, J. H. Lansing, Malleable Founders' Society, Cleveland, Ohio, R. W. Schroeder, University of Illinois, R. W. Heine, F. G. Sefing, E. M. Strick, Erie Malleable Iron Co., Erie, Pa., Jess Toth, Harry W. Dietert Co., Detroit, Mich., and A.F.S. Technical Director S. C. Massari.

Brass and Bronze division

Meeting in the Congress Hotel, Chicago, September 26, the Brass and Bronze Division decided to again sponsor shop courses at the annual A.F.S. Convention. Subject of the courses will

be "*Furnace Operation, Melting, and Refractories.*" The program is to be organized by a committee under the chairmanship of R. J. Keeley, H. Kramer & Co., Philadelphia, Pa.

William Romanoff, H. Kramer & Co., Chicago, Ill., reported for the Recommended Practices Committee that the publication, *Copper-Base Alloys Foundry Practices* has been completed and is available. However, the committee will remain active to accumulate additional information and make revisions needed to improve succeeding editions.

Previously prepared questions promote great interest in Round Table Luncheon meetings, reported B. A. Miller, Baldwin-Lima-Hamilton Corp., Philadelphia, Pa., chairman of the Round Table Subcommittee. Mr. Miller stated that he will contact A.F.S. chapters to stimulate questions which have not been discussed previously, but which brass and bronze foundrymen might want answered.

The Program and Papers Committee has several papers to offer, reported W. B. Scott, American Brake Shoe Co., Meadville, Pa., committee chairman. Among them are discussions on melting losses in brass foundries, the effect of mold material on 85-5-5-5, perlite and its application in brass and bronze sands, the effect of defects on certain physical properties of bronzes, and a symposium on fracture test. W. M. Ball, Jr., R. Lavin & Sons, Cincinnati, Ohio, volunteered to organize a panel, the members of which would prepare 10-minute papers to be presented to start the symposium discussion.

It was agreed that the Brass and Bronze Division should petition the Sand Division to organize a Non-Ferrous Sand Committee. R. A. Colton, American Smelting & Refining Co., Barber, N. J., was appointed chairman of a special committee to select a specific problem which the new Committee could undertake as its initial effort.

Mr. Colton's committee also was asked to suggest names of other members to serve on the Non-Ferrous Sand Committee. H. H. Fairfield was appointed to assist Mr. Colton in the selection.

Present at the meeting were Chairman B. N. Ames, New York Naval Shipyard; Vice-Chairman W. B. Scott, American Brake Shoe Co.; W. M. Ball, Jr., R. Lavin & Sons; R. A. Colton, Federated Metals Div., American Smelting & Refining Co.; H. H. Fairfield, Wm. Kennedy & Sons, Ltd.; G. P. Halliwell, H. Kramer & Co.; J. F. Klement, Ampco Metal, Inc.; G. J. LeVrasse, Federal-Mogul Corp.; W. A. Mader, Oberdorfer Foundries, Inc.; K. A. Miericke, Baroid Sales Division, National Lead Co.; B. A. Miller, Baldwin-Lima-Hamilton Corp.; F. L. Riddell, H. Kramer & Co.; C. A. Robeck, The Gibson & Kirk Co.; William Romanoff, H. Kramer & Co.; W. L. Rudin, Elesco Smelting Corp.; B. W. Schafer, Detroit Electric Furnace Division, Kuhlman Electric Co.; and S. C. Massari, Technical Director, A.F.S.

Pattern division

At a meeting at A.F.S. headquarters October 22, E. T. Kindt, Kindt-Collins Co., Cleveland, Ohio, chairman, Pattern Division, announced that Joseph W. Costello, American Hoist & Derrick Co., St. Paul, Minn., had been selected by the Nominating Committee to serve as vice-chairman of the division as well as chairman of the Program and Papers Committee to fill the vacancy caused by the death of Harry Lees, Whitin Machine Works, Whitinsville, Mass.

Plans for the Pattern Division's activities at the Convention include the presentation of papers on patterns for shell molding, evaluation of pattern castings, and a Round Table Luncheon, at which a question-and-answer program would discuss general pattern problems.

It was reported that the Patternmaking Manual probably will be available December 1.

Members attending the session were Chairman E. T. Kindt, Vice-Chairman J. W. Costello, W. H. Dashiell, Kindt-Collins Co., Barrington, Ill., A. F. Pfeiffer, Allis Chalmers Mfg. Co., Milwaukee, Wis., L. F. Tucker, City Pattern & Foundry Co., Inc., South Bend, Ind., M. K. Young, U. S. Gypsum Co., Chicago, Ill., and A.F.S. Technical Director S. C. Massari.

Electric eyes control and regulate any emergency smoke condition in all parts of the plant.

Lone Star Steel Co., Dallas, set a new record recently when 1407 tons of pig iron were drained from their giant blast furnace, "Flossie Bell," to hang up a new one-day production record. The furnace has a rated capacity of 1200 tons and the new 1407-ton mark for a 24-hr period is by far the highest mark ever attained. Superintendent Stark estimated that the absolute maximum for the furnace in a 24-hr period would be about 1450 tons.

National Industrial Sand Association, Washington, D. C., won the final decision in the case of NISA vs AC&Y regarding reduction of rates on sand shipments. Interstate Commerce Commission upholds NISA and recommended that the original Industrial Sand Case relationships which had been upset by the general increases be re-instated. These rates were: for distances up to 200 miles, closed car rates not more than 15 per cent higher than open car rates; for distances over 300 miles, equal rates for sand in open and in closed cars. The decision will result in a saving of approximately 50¢ per ton on many sand shipments. A mileage scale was prescribed by the commission. Chairman of the traffic committee which carried the project through for NISA is Emery Durstine, Keener Sand & Clay Co., Columbus, O.

STATEMENT OF OWNERSHIP

Statement of the ownership, management, circulation, required by the Act of Congress of August 24, 1912, as amended by the Acts of March 3, 1933, and July 2, 1946 (Title 39, United States Code, Section 233), of AMERICAN FOUNDRYMAN, published monthly at Chicago, Ill., for October 1, 1952. 1—The names and addresses of the publisher, editor, managing editor and business manager are: Publisher, American Foundrymen's Society, 616 S. Michigan Ave., Chicago, Ill.; Editor, Herbert F. Scobie, 616 S. Michigan Ave., Chicago, Ill.; Managing Editor, none; Business Manager, William W. Maloney, 616 S. Michigan Ave., Chicago, Ill. 2—The owner is American Foundrymen's Society, organized not for profit, without stock. Principal Officers: President, I. R. Wagner, Electric Steel Castings Co., Indianapolis, Ind.; Vice-President, Collins L. Carter, Albion Malleable Iron Co., Albion, Mich.; Secretary-Treasurer, Wm. W. Maloney, Chicago, Ill. 3—The known bondholders, mortgagees, and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages, or other securities are: none. 4—Paragraphs 2 and 3 include, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting; also the statements in the two paragraphs show the affiants' full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of bona fide owner. Herbert F. Scobie, editor. Sworn to and subscribed before me this 15th day of September 1952. (Seal). E. R. May, notary public. (My commission expires March 14, 1956.)

▶ *Will aid 100 French foundries in expanded productivity effort*

■ The Foundry Syndicate of the French Government has requested that the Mutual Security Agency expand its efforts to increase productivity in the French foundry industry and extend the work previously undertaken in nine demonstration plants to approximately 100 foundries. The program, which began about a year ago, sent U. S. foundry specialists along with French engineers into nine test foundries representing a cross-section of nearly 3,000 French foundries. It was hoped that by assisting these foundries to apply modern techniques of productivity, the remainder of the country's industries would be shown the advantages and practicality of similar innovations in production, labor-management relations and other methods of achieving high output at low unit cost.

Local currency costs to cover the consultants' transatlantic travel and living allowances in France will be paid from the French counterpart fund. These costs to the French are estimated at 20 million francs. In addition, participating foundries will support the program by direct contributions totaling 283 million francs. The U. S. share of the cost will cover the dollar salaries of the American team members.

coming events

November

17. . Northern California

Hotel Shattuck, Berkeley. H. K. Salzberg, Borden Co., Chemical Div., Bainbridge, N. Y. "*Shell Molding.*"

17. . Quad City

Fort Armstrong Hotel, Rock Island, Ill. Thomas E. Eagan, Cooper-Bessemer, Corp., Grove City, Pa. "*Practical Aspects of Nodular Iron.*"

18. . Eastern New York

Circle Inn, Latham, N. Y., Thomas E. Barlow, Eastern Clay Products Dept., International Minerals & Chemicals Corp., Chicago. "*Cupola Operations & Basic Cupolas.*"

19. . Oregon

Heathman Hotel, H. K. Salzberg, Borden Co., New York, "*Shell Molding.*"

19. . American Standards Association

Waldorf-Astoria Hotel, New York. Annual Meeting.

19. . Central Michigan

Hart Hotel, Battle Creek, Mich. Film, "*The Invisible Shield.*" Talk by freshman coach Michigan State College.

20. . Penn State

Penn State College, foundry classroom. E. C. Troy, Consultant, Palmyra, N. J.

20. . Washington

Frye Hotel, Seattle. H. K. Salzberg, Borden Co., Chemical Div., Bainbridge, N. Y., "*Shell Molding.*"

20-21. . American Society for Quality Control

Claypool Hotel, Indianapolis, Indiana. Seventh Midwest Conference.

21. . Ontario

Prince Edward Hotel, Windsor, Ont., Can. Guy Pealer, General Electric Co., Elmira, N. Y. "*Methods to Produce Better Castings.*"

21. . British Columbia

Vancouver Vocational Institute. H. K. Salzberg, Borden Co., Chemical Div., Bainbridge, N. Y. "*Shell Molding.*"

21. . Malleable Founders' Society

Drake Hotel, Chicago. Western Sectional Meeting.

November

28-29. . Chesapeake

Engineers Club, Baltimore. Cuopla Practice School. M. W. Demler, Harbison-Walker Co., Pittsburgh, *"Cupola Operation.* H. W. Lownie, Jr., Battelle Memorial Inst., *"Fuels."* T. E. Barlow, Eastern Clay Products Dept., International Minerals & Chemical Corp., Chicago, *"Acid Cupola Operation."*

December

1 . . Central Indiana

Athenaeum Bldg., Indianapolis. William N. Davis, A.F.S. Safety & Hygiene & Air Pollution Director. *"Safety-Air Pollution."*

1 . . Western Michigan

Bill Stern's Steak House, Muskegon, Mich. Boyd R. Hopkins, Girdler Corp., Louisville, Ky. *"Dielectric Core Baking."*

1 . . Chicago

Chicago Bar Asso. Walter Bonsach, Christiansen Corp., Chicago. *"Effects of Gating Design on Casting Quality."*

2 . . Rochester

Seneca Hotel, Rochester, N. Y. S. C. Massari, A.F.S. Technical Director. *"Effect of Gating Design on Casting Quality."*

4 . . Canton District

Massillon Moose Club, Massillon, Ohio. E. T. Kindt, Kindt-Collins Co., *"Trends In the Pattern Industry."*

4-6 . . American Institute of Mining and Metallurgical Engineers

William Penn Hotel, Pittsburgh, Pa. Electric Furnace Steel Conference.

5 . . Central Michigan

Hart Hotel, Battle Creek, Mich. Christmas party.

5 . . Western New York

Sheraton Hotel, Buffalo, N. Y. G. A. Purdy, Aluminum Company of America, Cleveland. Kurt S. Sealander, Aluminum Company of America, Buffalo, N. Y.

5 . . Quad City

Blackhawk Hotel, Davenport, Iowa. Christmas party.

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December

6. . N. Illinois-S. Wisconsin

Faust Hotel, Rockford, Ill. Christmas party.

8. . Michiana

Morris Park Country Club, South Bend, Ind. Guy Pealer, General Electric Co., Elmira, N. Y. *"Methods of Producing Better Castings."*

9. . Penn State

Penn State College foundry classroom. Robert Madison, Whitehead Bros., *"Sand."*

11. . Philadelphia

Benjamin Franklin Hotel, Philadelphia. Christmas party.

11. . Northeastern Ohio

Tudor Arms Hotel, Cleveland. Christmas party.

12. . Western Michigan

Spring Lake Country Club. Christmas party.

12. . Southern California

Lakewood Country Club, Lakewood Village, Calif. Christmas stag party.

12. . Eastern Canada

Mount Royal Hotel, Montreal, Que., Clyde A. Sanders, American Colloid Co., *"How Can Molding and Mold Materials Affect Metal Shrinkage?"*

12. . Ontario

London, Ontario, Can. Guy Pealer, General Electric Co., Elmira, N. Y. *"Methods to Produce Better Castings."*

13. . Central New York

Onondaga Hotel ballroom, Syracuse, N. Y. Christmas party.

13. . Central Ohio

Seneca Hotel, Columbus, Ohio. Christmas party.

13. . Central Illinois

American Legion Hall, Peoria, Ill. Christmas party—ladies night.

16. . Twin City Chapter

Nicollet Hotel, Minneapolis. Christmas party.

16. . Eastern New York

Circle Inn, Latham, N. Y. Christmas party.

A.F.S. Publications

	Publication Number	A.F.S. Members	Non-Members
Books			
Alloy Cast Irons Handbook (2nd Edition)	1	$2.75	$4.50
Analysis of Casting Defects	3	2.50	4.25
Copper-Base Alloys Foundry Practices	57	3.75	5.75
Cupola Operations Handbook	7	6.00	10.00
Development of Metal Castings Industry	8	3.00	6.00
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December

19. . Chesapeake

Engineers Club, Baltimore. R. E. Morey, Naval Research Laboratory, Washington, D. C. "*The Effect of Binders in the Development of Sand Strength.*"

19. . Metropolitan

Essex House, Newark, N. J. Christmas party.

1953

January

5. . Central Indiana

Athenaeum Bldg., Indianapolis. G. Vennerhold, Ford Motor Co., Dearborn, Mich.

February

6-7. . California Regional Fdy. Conf.

University of California, Berkeley. Sponsored by A. F. S. Northern California and Southern California Chapters and the University of California.

12-13. . Wisconsin Regional Fdy. Conf.

Schroeder Hotel, Milwaukee. Sponsored by Wisconsin Chapter and University of Wisconsin.

16-19. . Industrial Ventilation Conf.

Michigan State College, East Lansing, Mich.

19-20. . Southeastern Regional Conf.

Tutwiler Hotel, Birmingham, Ala. Sponsored by Birmingham District & Tennessee Chapters and University of Alabama Student Chapter.

16-20. . Nat'l. Asso. Corrosion Engrs.

Chicago. Symposium: "*Protective Coatings.*"

24-25. . Foundry Safety and Hygiene Conference

University of Wisconsin, Madison, Wis.

May

4-8. . A.F.S. 57th Annual Convention

Chicago. Five-day, non-exhibit convention.

June

29-July 3. . American Society for Testing Materials

California-Haddon Hall, Atlantic City, N. J. Annual Meeting.

Michigan

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the type of nodule by citing the properties of malleable and ductile iron of the same analysis and heat treatment. Both had the same tensile strength and yield point, but the ductile iron had approximately twice the elongation.

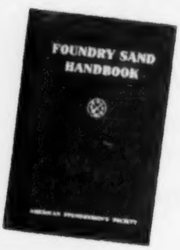
Mr. Eagan described production of nodular iron castings at Cooper-Bessemer starting with the first heat early in 1949. Castings range from one pound to six tons, he said. He showed slides of nodular iron castings representing conversions from forgings, weldments, and other such methods of production.

Final conference speaker was Bruce Smith, General Motors Corp., Detroit, who told how GM plants coordinate their activities. Chairman of the meeting was Harry W. Dietert, Harry W. Dietert Co., Detroit.

In addition to Conference Chairman Toth, the conference committee included Prof. Orlan W. Boston and Prof. Donald L. Katz, University of Michigan, *honorary chairmen;* Prof. Richard Schneidewind, *vice-chairman;* Lachlan Currie, Gale Mfg. Co., Marshall, *secretary;* and Prof. Flinn, *treasurer.*

Advisors were: Messrs. Boyd, Dietert, Packer, Rote, Sigerfoos, and Walls; William G. Cannon, Nugent Sand Co., Muskegon; Fitz Coghlin, Dock Foundry Co., Three Rivers; Gerald A. Conger, Stevens Mfg. Co., Johnstown, Pa.; Charles H. Cousineau, Carpenter Bros. Co., Muskegon; Albert E. Edwards, Chevrolet Grey Iron Foundry, GMC, Saginaw; Fred J. DeHudy, Centrifugal Foundry Co., Muskegon; A. E. Jacobsen, Jr., Grand Haven Brass Foundry Co., Grand Haven; Raymond H. Klawuhn, General Foundry & Mfg. Co., Flint.

Also among the advisors were: Thomas T. Lloyd, Albion Malleable Iron Co., Albion; James McDonald, Saginaw Malleable Iron Div., GMC, Saginaw; Kenneth H. Priestly, Vassar Electroloy Products Co., Vassar; Vaughan C. Reid, City Pattern Foundry & Machine Co., Detroit; Ross P. Shaffer, Lakey Foundry & Machine Co., Muskegon; Prof. Austen J. Smith, Michigan State College, Prof. William A. Spindler, University of Michigan; Michael Warchol, Atlas Foundry Co., Detroit; and Prof. William P. Wood, University of Michigan.



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